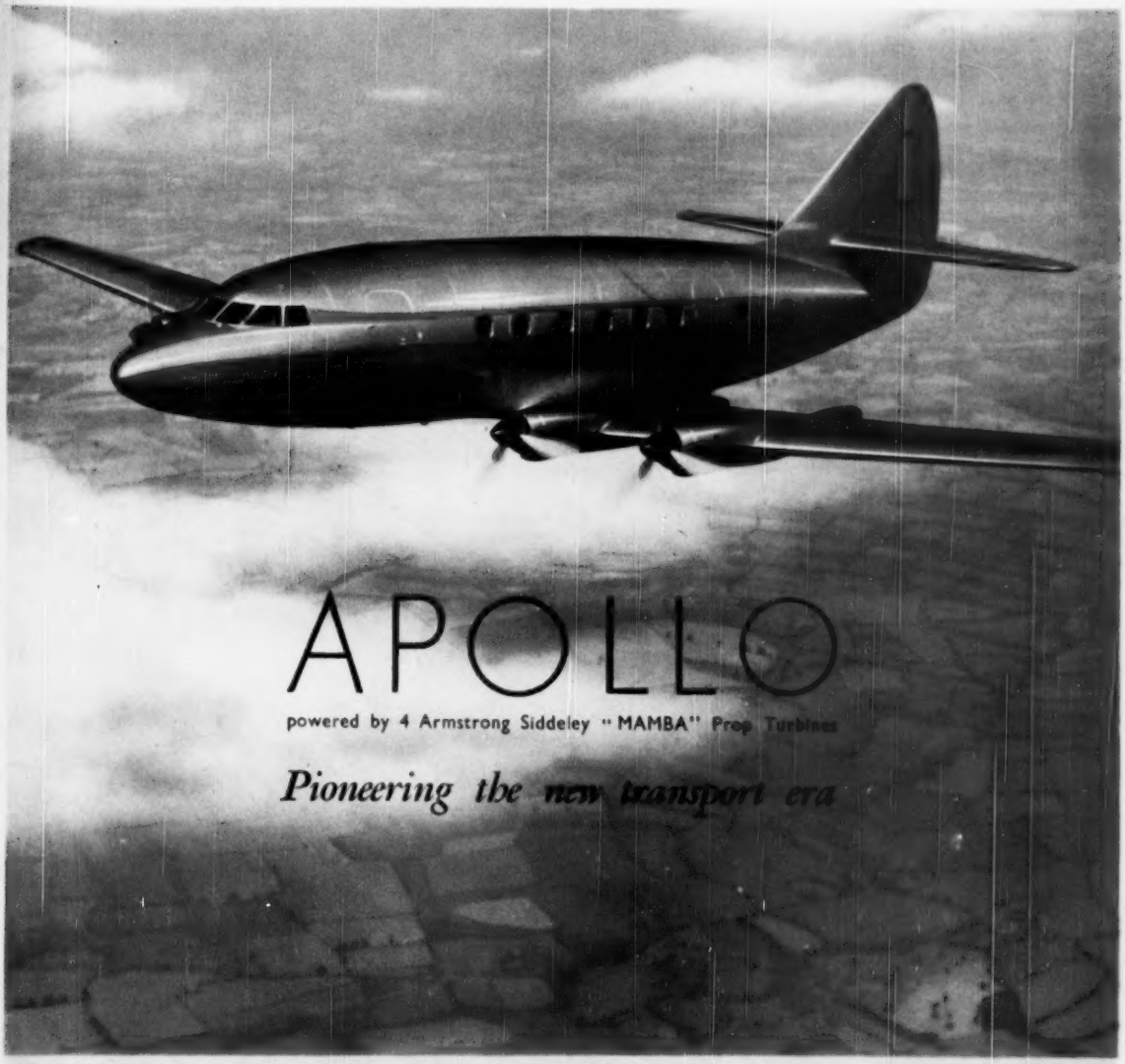
30 MARCH 1950 ONE SHILLING

FLIGHT
and
AIRCRAFT ENGINEER

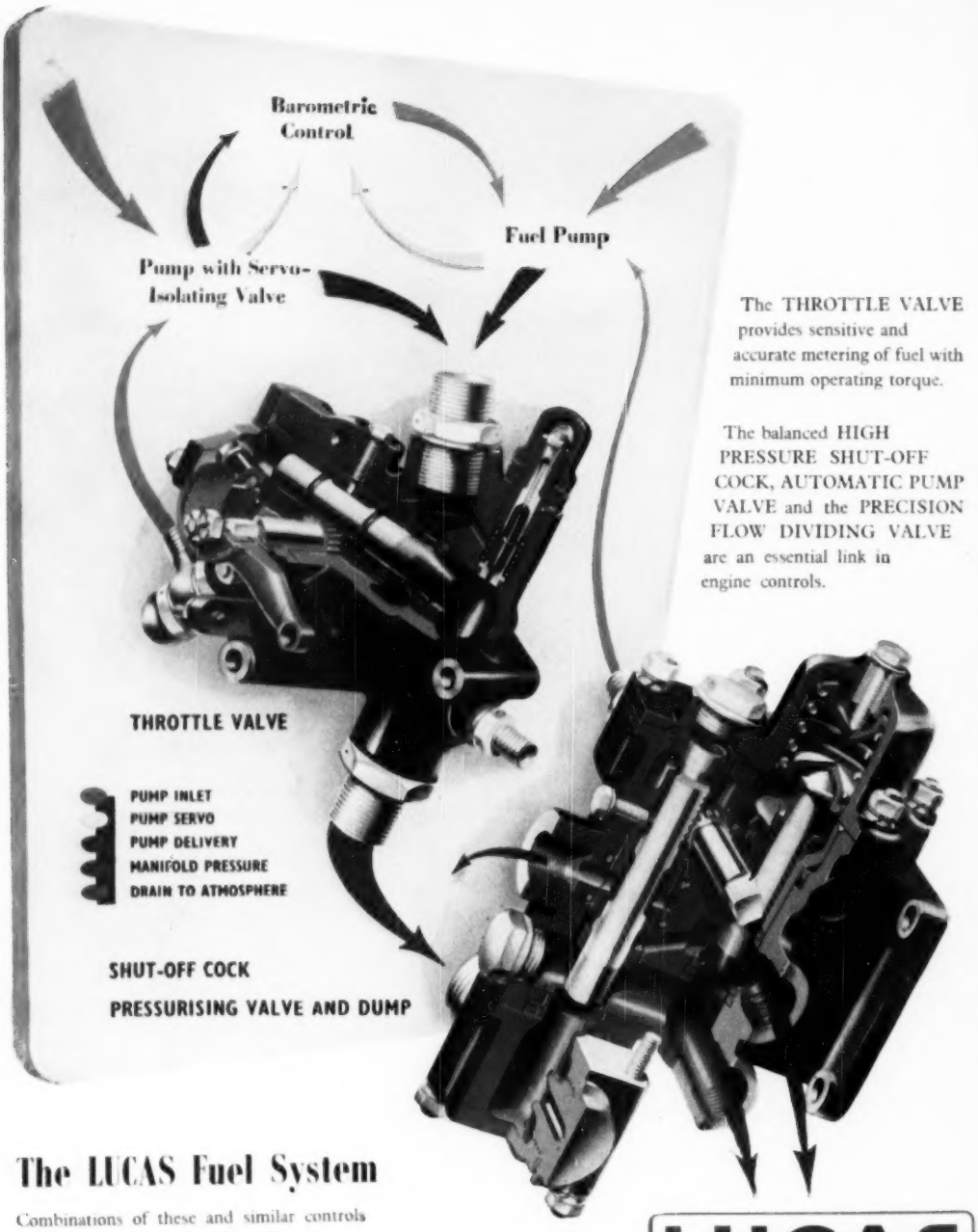
OFFICIAL ORGAN OF THE ROYAL AERO CLUB



PACEMAKERS AWA OF PROGRESS

SIR W. G. ARMSTRONG WHITWORTH AIRCRAFT LTD. BAGINTON, COVENTRY. BRANCH OF HAWKER SIDDELEY GROUP LTD.

Cogent



The THROTTLE VALVE provides sensitive and accurate metering of fuel with minimum operating torque.

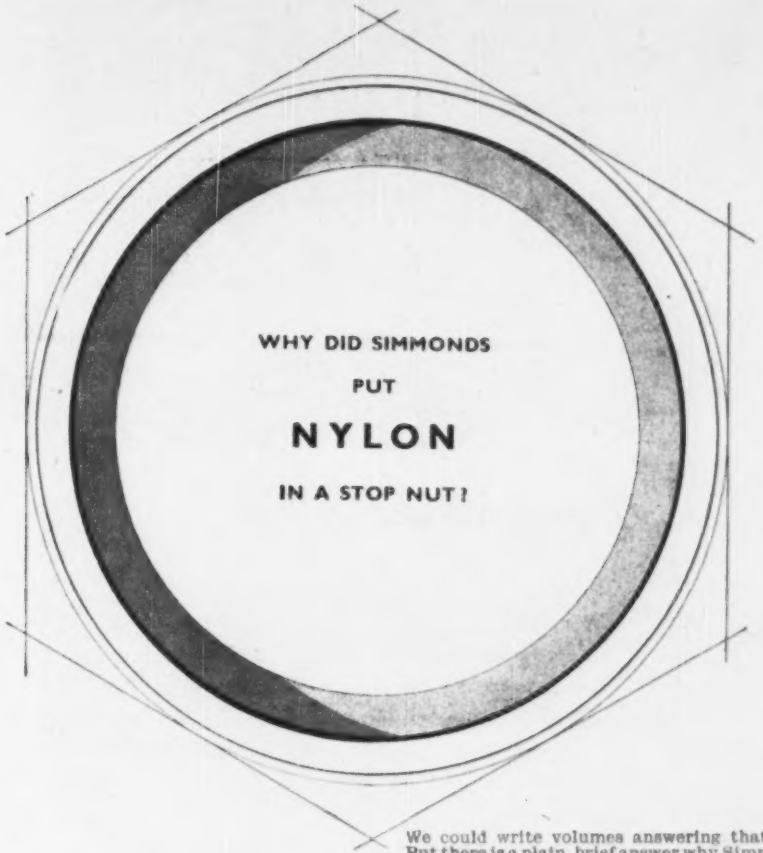
The balanced HIGH PRESSURE SHUT-OFF COCK, AUTOMATIC PUMP VALVE and the PRECISION FLOW DIVIDING VALVE are an essential link in engine controls.

The LUCAS Fuel System

Combinations of these and similar controls play their part on many Gas Turbine engines throughout the world.

LUCAS

JOSEPH LUCAS (GAS TURBINE EQUIPMENT) LTD. BIRMINGHAM



We could write volumes answering that one. But there is a plain, brief answer why Simmonds are now producing the NYLOC, the first Stop Nut with a Nylon insert. This is it: The NYLOC remains absolutely steadfast under extremes of temperature and humidity; under immersion in oil, petrol and boiling water.

NYLOC has immense endurance, for instance, a ¼" B.S.F. nut after 400 removals maintained a torque figure in excess of normal minimum requirements. Severe tests have resulted in the approval of the NYLOC Stop Nut for use in aircraft construction, and the following extracts have been taken from the Royal Aircraft Establishment test report :—

ENDURANCE TEST.—6 Nyloc nuts screwed 30 times on and off standard bolt had final average torque of 2.100 lbs./ins.

IMMERSION TEST.—Sample nuts after 7 days in Glycol, F.75, DTD 44D, and DTD 641, maintained torque performance. Nylon is extremely resistant to all oils, petrol, paraffin, kerosene and boiling water.

TEMPERATURE TEST.—At temperatures between 22°C. and 220°C. on a standard bolt, torque ranged from 3.6 lbs./ins. to 2.3 lbs./ins. At—55°C. unscrewing torque was 3.75 lbs./ins.; at—65°C., 5.92 lbs./ins.

AGEING TEST.—Air conditions of 100°F. and 95% relative humidity for 42 days. Nyloc Nuts increased their torque value from 3.78 lbs./ins. to 5.8 lbs./ins.

nothing rattles the

SIMMONDS NYLOC STOP NUT

PATENT APPLIED FOR

Enquiries to :

SIMMONDS AEROCESSORIES LIMITED, BYRON HOUSE, 7-8, ST. JAMES'S ST., LONDON, S.W.1

HEAD OFFICE AND WORKS: TREFOREST, GLAMORGAN

Thoroughbred

For more than thirty years, Boulton Paul designers have concentrated their energy and experience on the production of high performance Service aircraft. Bourges, Bugle, Sidestrand, Defiant—these have been names to remember, as much for serviceability as for brilliant performance.

And now the Balliol, after the most rigorous Service trials at home and abroad extending over twelve months, and in the face of keen competition has won its way to success through its intrinsic engineering qualities.

BALLIOL

ADOPTED BY THE R.A.F.

BOULTON PAUL AIRCRAFT LTD.

WOLVERHAMPTON

We're in this too!

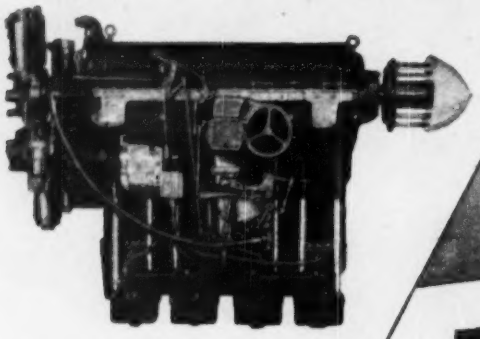
Designed to give military aircrews of the future day and night training, the Vickers Varsity inspires confidence in British ability to keep ahead in the air. James Booth & Co. are proud to note the confidence placed by this great firm in DURALUMIN*— used for the 'Varsity's' airframe and skin.

BOOTH BIRMINGHAM

**DURALUMIN is the registered Trade Mark of James Booth & Co.*

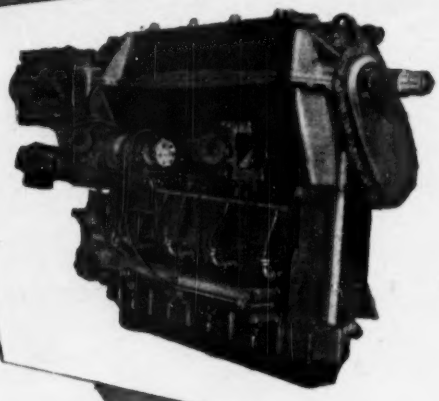
JAMES BOOTH AND COMPANY LIMITED · ARGYLE STREET WORKS · BIRMINGHAM 7

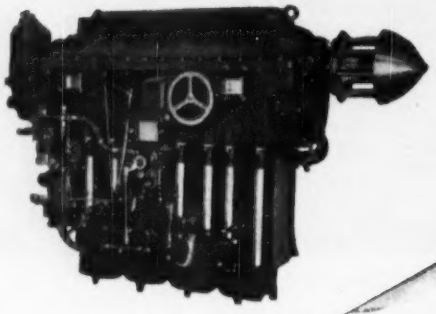
FOR HEAVY DUTY IN LIGHT AIRCRAFT-



MAJOR

A tough and compact, 4-cylinder in-line, air-cooled engine of proved performance. Series II develops 150 h.p. and Series III, of higher compression, 155 h.p.





BOMBARDIER

180 h.p. Latest of the line and first British Direct Petrol Injection engine to pass A.R.B. approval tests. One of Bombardier's main advantages is in giving *greater power for weight.*

MINOR

Series I, 90 h.p. ; Series II, 100 h.p. The Air Registration Board now permits Minor II to run for 800 hours before complete overhaul—*a gain of 200 hours.*

The reputation for performance, reliability and economy which Cirrus Engines have built-up over the years has gained them the unwavering confidence of the designer and user of light aircraft. That is why so many established light aeroplanes are powered by Cirrus and why so many new designs incorporate these famous units.

THE Cirrus GROUP OF POWER PLANTS

BLACKBURN & GENERAL AIRCRAFT LTD., BROUGH, E. YORKS

CIRRUS

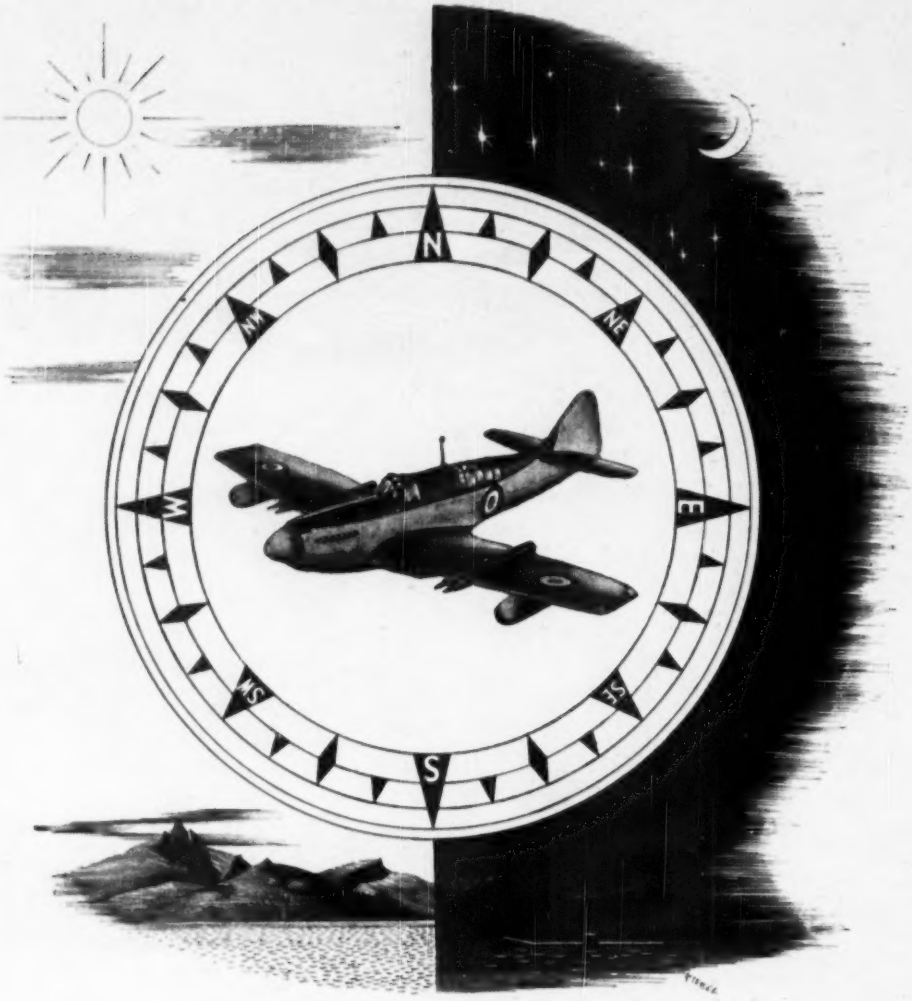
9BE/5

THE VICKERS "VARSITY" *(Bristol Hercules 264 engines)*

In the Varsity, now on order for the R.A.F., aircrews of tomorrow will receive day and night training in piloting and navigation, bombing and signals. This airborne schoolroom is a development of the Valetta with a bomb aimer compartment underneath the fuselage, tricycle undercarriage, increased wing span and larger flaps.

VICKERS-ARMSTRONGS LIMITED · AIRCRAFT DIVISION · WEYBRIDGE WORKS · WEYBRIDGE · SURREY

Fully equipped for all day and night operations



Cleared for all climates in the world

THE VERSATILE *'Firefly'*

THE FAIREY AVIATION CO., LTD., HAYES, MIDDLESEX

FLIGHT
and
AIRCRAFT ENGINEER

First Aeronautical Weekly in the World

Founded 1909

No 2153 Vol. LVII. THURSDAY, 30 MARCH 1950

EDITORIAL DIRECTOR
G. GEOFFREY SMITH, M.B.E.

EDITOR
MAURICE A. SMITH, D.F.C.

ASSISTANT EDITOR
H. F. KING, M.B.E.

TECHNICAL EDITOR
C. B. BAILEY-WATSON, B.A.

ART EDITOR
JOHN YOXALL

Editorial, Advertising and Publishing Offices :

DORSET HOUSE,
STAMFORD STREET,
LONDON, S.E.1.

Telegrams : Flightpress, Sedist, London.
Telephone : Waterloo 3333 (60 lines).

Branch Offices :

COVENTRY
8-10, Corporation Street.
Telegrams : Autocar, Coventry.
Telephone : Coventry 5210.

BIRMINGHAM, 2.
King Edward House,
New Street.
Telegrams : Autopress, Birmingham.
Telephone : Midland 7191 (7 lines).

MANCHESTER, 3.
260, Deansgate.
Telegrams : Iliffe, Manchester.
Telephone : Blackfriars 4412 (3 lines).
Deansgate 3595 (2 lines).

GLASGOW, C.2.
26b, Renfield Street.
Telegrams : Iliffe, Glasgow.
Telephone : Central 4857.

SUBSCRIPTION RATES
Home and Overseas : Twelve months £3 1s. 0d. Six months, £1 10s. 6d. U.S.A. and Canada, $10.00.

BY AIR : To any country in Europe (except Poland). Twelve months, £5 1s. 0d. Six months, £2 10s. 6d. Canada and U.S.A. Six months, $16.

In this issue:

Superforts with Roundels 392
Air Estimates Debated - 394
The Comet in Rome - 404
Aircrew Trainer - - 406
American Notebook - 411
Maintenance and Safety - 416

Estimation

THE accounts of the Air and Navy Estimates Debates appearing on pages 394-395 are reassuring confirmation of the interest displayed by Members of Parliament in the technicalities of air and anti-submarine warfare. On the other hand, they are also evidence of the disturbing lack of dependable information on the composition and effectiveness of a potential enemy.

Of the world's great air forces, those of the U.S.A. have been freely publicized, for they are strong; of the R.A.F. and Naval Aviation little more can be said than is contained in our accounts of the Debates, and from these it will be learned that serious deficiencies persist. Of the Soviet Union a great deal has been written, but very little, in our own estimation, is known. Each week brings new assessments of strength, effectiveness and aims of Russian service aviation; but how much of this is based on factual knowledge? On strength *Flight* declines to pronounce, for we are in no position to do so, but about technical developments there are grounds, at least, for useful conjecture.

The Russian strategic bomber force probably comprises a number of squadrons equipped with a version of the Boeing B-29—possibly of higher performance, though hardly so effective as the B-50 which now equips U.S.A.F. units based in this country. Though the Russian fighter and fighter-bomber force is still comprised largely of piston-engined machines, appreciable quantities of jet-propelled types are indubitably in service. In the 1948 May Day parade, for example, four types made their appearance, either as prototypes or as the equipment of squadrons. To our own mind, however, a more serious consideration is that some dozens of jet fighters with swept-back wings and tail surfaces (we will not presume to guess at their designation) participated last year. This fact, at least, denotes great activity in the development of fighters, and the R.A.F. could not, on present estimates, display a similar quantity of such aircraft within a period of two years. It may be that the machines concerned suffer from the same shortcomings as do comparable American types, of which poor handling qualities at extreme height and the inability to operate from small airfields are among the most serious; but at least their Mach Number should be appreciably higher than that of any standard R.A.F. fighter. The importance of this lies not only in the high speeds attainable, but in the peace of mind it affords the pilot in combat, especially at high altitude.

That these advanced fighters do exist in Russia is one of the few incontrovertible facts—and a very disturbing one. We must hope that the "balanced" air force advocated in the House is not merely an admission of gravely deficient Intelligence.

The Under-water Menace

IN spite of the general apprehension regarding atom and hydrogen bombs, Britain and the United States are apparently becoming more and more concerned with the problems of defence against large-scale Schnorkel-depth submarine attack.

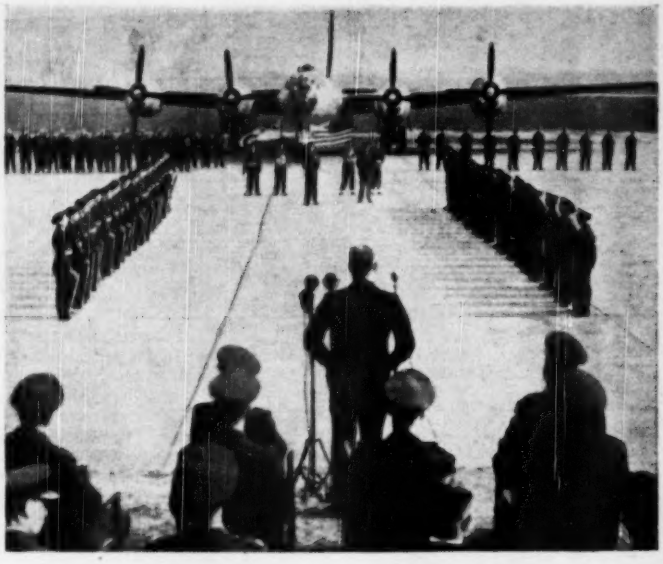
From the point of view of air power, it is perhaps well to remember that during the war more than 50 per cent of all U-boats sunk were credited to aircraft and all but a handful to land-based aircraft. Specialized anti-submarine aircraft have not been neglected in this country—far from it. Two of our newest prototypes—the Fairey G.R.17 and Blackburn Y.A.5, of which the latter has already undergone preliminary deck-landing trials—are designed specifically for the work of seeking out, marking and destroying submarines. Moreover, the four-engined Avro Shackleton is a long-range aircraft of post-war design, for maritime reconnaissance and attack. There is still a good deal of operational life left in the Fairey Firefly, which may be charged with the medium-endurance strike and reconnaissance responsibilities eventually to be taken over by one of the two new aircraft that, in service form, are expected to be powered by double-Mamba turboprops.

The time has undoubtedly come when Naval and R.A.F. staffs should strengthen their co-operative measures to avert the possibility of a submarine blockade which could prove fatal to these islands.

SUPERFORTS WITH ROUNDELS

First Four of Seventy R.A.F. B-29s Delivered to Marham

Illustrated by "Flight" Photographs



ON the misty morning of March 22nd, Mr. Arthur Henderson, Secretary of State for Air, and Major-General Leon W. Johnson, Commander of the Third Air Division, U.S.A.F., flew to R.A.F. Station, Marham. Their agreeable duty was to welcome the first four of seventy B-29 medium bombers to be delivered to Britain under the U.S. Military Aid Programme, and ahead of them flew a U.S.A.F. C-47, bearing, among others, *Flight's* representative. Arriving at Marham, he found the R.A.F. ensign and "Old Glory" streaming out side by side, for a breeze was fast dispersing the mist. An R.A.F. guard of honour, with rifles and fixed bayonets, faced a corresponding U.S.A.F. guard, unarmed and white-gloved. No. 2 Regional Band of the R.A.F. stood ready.

By this time one B-29 had landed (with its starboard inner airscrew feathered as the result of an oil leak), and at intervals the other three, looking spick and span, and with R.A.F. roundels emblazoned on wings and fuselage, made their steep approaches.

As a single machine taxied towards the waiting parade the U.S. serial number—461599—could be made out on the fin. The Two-row Cyclones were silenced and a tractor quietly jockeyed the massive Boeing to its allotted station behind the standard bearers; then crew-members, with varicoloured caps, denoting their respective aircraft, descended to trim the airscrews in accord with the orderly aspect of the gathering. This accomplished, they formed up before the starboard wing, with an R.A.F. crew on the opposite side.

Mr. Arthur Henderson, Secretary of State for Air, had a cordial word of greeting for the ferrying crews. Beyond is Major-General Leon W. Johnson, Commander of the 3rd Air Division. General Johnson won the Congressional Medal of Honour—his nation's highest decoration—for courageous flying during the Liberator raids on the Rumanian oilfields in 1943.

The British and U.S. official parties now arrived and, attended by the station commander, G/C. P. W. Stansfeld, D.F.C., Mr. Henderson made his inspection of the guard of honour. In company with General Johnson, General Anderson (Deputy Commander, Third Air Division), Colonel S. W. Agee (Deputy Chief of the U.S. Military Aid Advisory Group for the United Kingdom) and Air Marshal Sir Hugh Lloyd (A.O.C.-in-C., R.A.F. Bomber Command), he passed on to greet members of the U.S. crews, representing a contingent of 62 who had ferried the B-29s from Washington, by way of Bermuda and the Azores.

The Assembly of American and British personnel and their friends then heard the Secretary of State express the hope that further B-29s—additional to the initial batch of seventy—might follow. They would never be used, he said, for purposes of aggression; never used, in fact, except in conformity with the charter of the United Nations. Their supply was further evidence of the intention of the U.S.A. and Britain to co-operate steadfastly in resisting any attempts at aggression and in the promotion of world peace.

General Johnson spoke briefly and with deep sincerity, emphasizing that the machines denoted the intention of Britain, America and other countries who liked their own way of life to continue their task unhindered. "They will never strike out," he said; "they will only strike back."

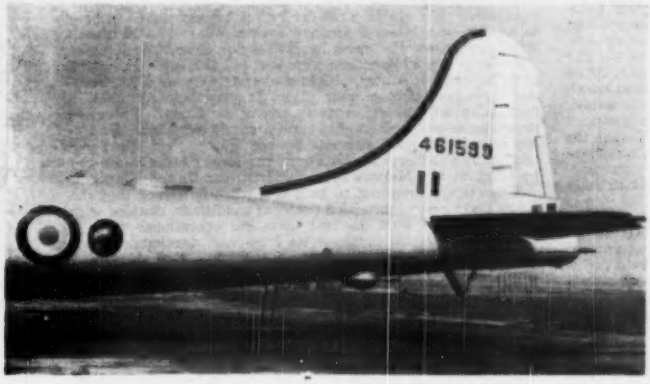
After the ceremony the writer met Major W. C. Lewis, who led the delivery flight and who (as a bomb aimer, and not in his present capacity as pilot) participated in the first U.S. bomber raid from a British base, in August, 1942, against targets in Rouen. The major and most of the aircrew under his command will remain here for three months to assist conversion of R.A.F. crews, hitherto operating on Lincolns. A mobile training unit of the type used by the U.S.A.F., and equipped with sectioned engines, turrets and systems, has already been consigned to Marham.

It was officially announced that the R.A.F. B-29s are

At left is the scene as the Secretary of State addressed the parade and assembly at Marham. American and British aircrew are lined up in front of one of the first four B-29 Superfortresses to be delivered to the R.A.F.

A welcome sight for Bomber Command—one of the B-29s about to touch down on British concrete. The front-upper, front-lower, rear-lower and tail barbettes are visible.

A short-range view to show the R.A.F. roundels and fin-flash, sighting stations, and rear-upper, rear-lower and tail barbettes of a Superfortress



being drawn from the stored reserves of the U.S.A.F. and from squadrons which have been re-equipped with later types. The B-29 has a considerable advantage over the Lincoln in bomb load, range, cruising speed and operational ceiling; specifically, it can carry 20,000 lb of bombs further than the Lincoln can carry 12,000 lb.

Four instructor crews of Bomber Command, each consisting of a pilot, navigator, engineer, wireless operator, bomb aimer and gunner, have already spent a month at Marham, familiarizing themselves with B-29 operation under the guidance of American personnel. Two additional crews have recently reported for duty, and a total of eight is foreseen for the R.A.F. B-29 conversion unit, which will be based at Marham and may be equipped with ten aircraft.

Though the U.S.A.F. normally operates its B-29s with a crew of eleven men, the R.A.F. proposes to reduce the number to eight—pilot, 2nd pilot, engineer, signaller, navigator, radar operator, and two gunners. The twin 0.5in tail guns will not generally be directly manned, but will be trained from one of the sighting stations in the elaborate and highly effective fire-control system.

In the House of Commons last week Mr. Henderson announced that the U.S.A.F. has undertaken to assist the R.A.F. in the "major maintenance and overhaul" of the B-29s until other arrangements are made for this work to be done either within the Royal Air Force or by civil contractors.

ANTARCTIC RECONNAISSANCE

DURING the past quarter of a century aircraft have played a greater or smaller part in quite a number of Arctic and Antarctic expeditions, and with widely varying degrees of success. The end of one of the definitely successful efforts was marked last Saturday when the members of the R.A.F. Antarctic Flight returned to this country after some two months of arduous operations within the Antarctic Circle. They had been attached to the British-Scandinavian expedition to Queen Maud Land, where their principal duties were concerned with reconnaissance; in addition, they were able to accumulate some useful experience for the R.A.F.

The aircraft used were two Mk. 6 Austers (Gipsy Major 7 engine), and they were provided with alternative ski, float and wheel landing gears. The principal departure from standard equipment lay in the fitting of Plessey cartridge starters—which, it was reported, gave certain starting, without pre-heating, throughout the operation. Cabin-heating was provided by a duct from the exhaust system. Navigation was by radio-compass; normal V.H.F. communication equipment was used.

S/L. G. B. Walford was in command of the flight, with F/L. H. M. T. Tudor, D.F.C., assisting him in the flying duties. The aircraft were serviced by Sgt. P. D. Weston, B.E.M., and Cpl. W. B. Gilbey, while Cpl. L. A. Quar was radio operator; the last-named remained behind with the members of the expedition for a two-year sojourn on Queen Maud Land.

As the *Norsel* approached her objective two problems demanded solution: to find a way through the pack-ice to the ice-barrier which constituted the mainland and, having found it and closed the land, to discover amid the ice cliffs a suitable inlet and "shelf" where a landing could be made and a base-camp established. The first air sortie was made on January 31st, when pack-ice finally stopped the *Norsel* at 69 deg S, 4 deg E, and Capt. John Gavier, the expedition leader, asked for a reconnaissance, for which purpose he withdrew to clearer water so that S/L. Walford could take-off. No way through could be found, but next day F/L. Tudor, with Capt. Glaver as his passenger, found a "lead" which enabled the ship to get within sight of the barrier.

There followed a week of daily sorties by the two Austers, all made without incident, until, on February 10th, F/L. Tudor, flying low under an overcast sky, suddenly came upon a likely-looking inlet. Capt. Glaver was flown in and confirmed it, and the ship was taken in forthwith.

While the landing was being made a mild blizzard raged, which precluded flying but did not prevent the aircraft being put ashore and having their ski gear fitted.

No flying was possible until February 15th, on which day, however, 10½ hours were flown with various specialist members of the expedition as passengers. F/L. Tudor had a radio-compass failure, but skilfully found his way back to base in spite of low cloud and poor visibility.

Next day, while on a test flight with Sgt. Weston, S/L. Walford found visibility so good that he decided to confirm the suspected existence of a range of mountains which were of particular interest to the expedition's geologists. In this he was completely successful, and returned to base after being airborne for over three hours. F/L. Tudor was despatched on a confirmatory survey and, altogether, the two aircraft flew 12 hours on that one day.

Flying continued steadily until February 19th, when the planned total of 50 hours was completed and, the members of the expedition being well satisfied with the information provided, the aircraft were taken aboard the *Norsel* prior to her withdrawal.

On arrival in London, S/L. Walford and his party, who we had the privilege of interviewing, were loud in their praise of the reliability of the two Austers, their engines and their equipment in general.

THE AIR ESTIMATES DEBATE

"A Period of Acute Danger Over"—Mr. Henderson

THE Secretary of State for Air, **Mr. Arthur Henderson,** opened the debate on the Air Estimates, 1950-51,* in the House of Commons on March 21st, with the statement that the net total sum required was £223 million—an increase of £15,500,000 on the sums allowed last year. This increase was due to the exhaustion of wartime stocks and the consequent need for re-equipment as well as to increased prices. The maximum number of officers, airmen and airwomen who might be maintained at any time during the year was 215,000, compared with 255,000 voted for last year. The strength of the R.A.F. on April 1st, 1951, was expected to be 198,000.

The doubling of the front-line strength of Fighter Command's jet-fighter force, announced last year, was proceeding. All day-fighter and ground-attack squadrons overseas were now re-equipped with jets, with the exception of those in the Far East. Production orders had been placed for the Venom, which type should be coming in to squadrons next year, and which would be followed by jet fighters having speeds approaching that of sound. Eight R.Aux.A.F. squadrons had been equipped with jets, and eight more were to be re-equipped during the next twelve months. In the case of one or two of the remaining squadrons, certain airfield difficulties had to be overcome, but it was expected that all twenty squadrons would be fully equipped with jet aircraft by December next year.

A jet night-fighter with a performance comparable with that of other jet fighters was now in an advanced stage of development, and orders had been placed not only for the re-equipment of the existing night-fighter squadrons, but to expand the night-fighter force itself. A substantial number of squadrons should be re-equipped next year with the new fighter.

Extremely valuable work was being done on an advanced air-to-air guided missile. It was our aim to enable our fighters to attack and destroy the modern bomber from ranges beyond those of its defensive armament. Provision was being made for the modernization and extension of our control and reporting systems.

Bomber Progress

Seventy B-29 bombers would be absorbed into the front-line strength of Bomber Command. The Canberra had successfully completed initial flying trials, and rapid progress was being made to prepare it as a fully operational type. Canberra squadrons should be in service next year. The Australian Government had decided to build the type under licence. Although good progress was being made with four-jet bombers, we were still in a transitional period, and the B-29 and Canberra would constitute the main equipment of our striking force until these types began to come off production.

Coastal Command continued to develop the technique of anti-submarine warfare in close co-operation with the Navy, and all Coastal squadrons went through a course at the Anti-Submarine School every year.

Concerning prices, Mr. Henderson said that the Canberra cost more than a Lincoln, and a Meteor twice as much as a Spitfire.

The most substantial measure of economy was reduction in the number of transport squadrons in the United Kingdom; transport forces in Middle and Far East were being kept up to their present strength, and, indeed, their effectiveness would increase, as the medium-range squadrons were being re-equipped with Valettas.

The Central Bomber Establishment had been abolished; its size was roughly that of three bomber squadrons, and its retention would have meant that the front line of Bomber Command would have been correspondingly smaller. Command and Group headquarters' staffs were being cut by at least 10 per cent. The introduction of the Prentice as the basic trainer had enabled instrument flying instruction to be improved considerably, and trainees were now flying in weather previously considered impossible. The use of the Standard Beam Approach system for landing was a further help for pupils. The Balliol had been accepted as the new advanced trainer and should be a considerable improvement on the Harvard.

While the number of regular personnel now serving was about the same as last year, it represented a larger proportion of the total force. In ground trades recruiting declined at the end of 1949 and did not show the expected seasonal improvement. The recruiting position as a whole remained unsatisfactory. One of the most effective ways of overcoming the shortage of regulars would be to secure conditions which would enable larger numbers to re-engage for 22 years or even longer.

The A.T.C. and the Air Sections of the Combined Cadet Force now totalled 45,000 cadets. A project to re-establish three more University Air Squadrons must be postponed for the time being.

In Malaya our comparatively small Far East Air Forces, aided for a short time by 210 Squadron (Lancasters) from Coastal Command, had continued to discharge a wide variety of tasks in the war against the insurgents. These tasks had included strikes by Nos. 45, 33 and 60 Squadrons, convoy cover, photographic and visual reconnaissance, air lifts, supply drops, leaflet dropping and communications by Nos. 110, 48 and 52 Squadrons. The Middle East Air Forces had continued to help in maintaining internal security over a wide area. Particularly good work was done by No. 8 Squadron. A flight of Dakotas of No. 27 Squadron were sent out to Nigeria during the disturbances last winter. Fighter aircraft were used last summer to expose photographic plates at very high altitudes in connection with experiments in cosmic radiation. Extensive programmes of photographic survey continued. Mr. Henderson referred to joint exercises by the Middle East Air Force and the Royal Egyptian Air Force, the former being reinforced by Lincolns and Meteors flown out from the United Kingdom.

There was a time, not so long ago, when it seemed that the strain and stress of unsettled post-war conditions, coupled with the very heavy load imposed upon the operational units of the R.A.F., might endanger its long-term development and efficiency. It was Mr. Henderson's conviction that this period of acute danger to the future of the R.A.F. was now over and that we could look forward, as accommodation and career prospects improved and as new aircraft and equipment came forward to the squadrons, to a period of consolidation, increasing operational efficiency and continued expansion.

Mr. Macmillan (Cons., Bromley) expressed the view that the enterprise which had just produced the Comet could certainly produce high-speed, long-range bombers. If we depended on short-range or medium-range bombers of the Canberra type, it would mean bombing our friends, because we could only thereby get to the place where the enemy was likely to be occupying one's friends.

Mr. Henderson said he had not been able to give an indication of the range of this bomber and he did not intend to do so, but it must not be assumed that the Canberra was necessarily a short-range bomber.

Mr. P. B. Lucas (Cons., Brentford and Chiswick) remarked that, though he believed the B-29 to be a fine aircraft, we found ourselves, five years after the war, equipping our own great Air Force with a piston-engined aircraft which the Americans themselves now considered to be bordering on the obsolete. We were doing this at a moment when the Comet had burst upon the world of civil aviation to the general delight of all. He was reliably informed that it would be possible to adapt this civilian aircraft for bombing; that it would be possible not only to carry a considerable bomb load, but to attain a considerable range. Mr. Lucas believed that Russian jet-fighter production to-day amounted to some 60 aircraft per month, aircraft which bore comparison with the best produced by other countries. We had a right to be assured that, while we were concentrating on the development of high-altitude fighters, we were not neglecting our low-altitude aerial defence.

A. Cdre. Harvey (Cons., Macclesfield) said that the pay of junior officers was the same as 25 years ago. There was a case for giving flying pay for the men who took the risk. If more men were required in the fighting Services, the rates of pay would have to be increased.

He believed there was nothing to stop anybody from the Russian Embassy—until they were confined to a 30-mile limit—driving round Britain and seeing radar stations working. He wished to know how, if there should be a continuous attack of bombers, we should defend this country with jet fighters alone. Their short endurance was well known, and he wished to know if the Government were considering the problem. At the moment, night fighters could not catch the bomber—certainly not the Tu-4, the Russian bomber.

Sir Wavell Wakefield (Cons., St. Marylebone) wished to know what action was being taken by the R.A.F. to maintain an interest in the development of flying boats. He thought that a large flying boat, able to maintain patrol in mid-

* *Details of the Estimates, classified under "vote" headings, were given on pages 367-368 of "Flight" last week.*

Atlantic for a long period, was of the utmost importance.

Lord Malcolm Douglas-Hamilton (Cons., Inverness) said he did not think we should encourage ex-R.A.F. pilots of experience to keep their hand in in the R.A.F.V.R. with aircraft such as Tiger Moths. He submitted that part of an airman's training should be to visit other countries, and part of the training at R.A.F.V.R. schools should be visits to the Continent.

Mr. Charles Orr-Ewing (Cons., Hendon North) said that one had only to read the weekly newspapers at the time of exercises *Foil* and *Bulldog* to learn how, time and again, airfields were caught on the hop by low-flying aircraft coming in and catching aircraft on the ground refuelling. Everybody knew that aircraft could be easily detected at 30,000-40,000ft; it was the low, quick aircraft which were far more difficult to combat.

In the last war we lagged a good way behind the U.S.A.F. in Army support. They controlled their fighter aircraft by means of fighter direction units—radar units. By this means aircraft could be sent to the instant support of troops with great accuracy. It had been learnt that our close-support squadrons had been re-equipped with jets. These must fly reasonably low to give close support, and their endurance at low levels was less than three-quarters of an hour. With piston-engined aircraft one could leave them on a "cab rank" and call them off for the quick support of troops. This was not so with the jet; one could not call them off a "cab rank" at 35,000ft and get them down to where they were wanted. He asked if we were getting piston-engined aircraft which could fly and "stooge around about light anti-aircraft height in order that they could be called to the support of our troops." If not, he did not know what would happen.

NAVAL AIR EXPENDITURE

Anti-submarine Measures the Main Theme The "G.R.17" and Naval Jet Fighters

IN the debate on the Navy Estimates, in the Commons on March 22nd, the Parliamentary Secretary to the Admiralty, **Mr. James Callaghan**, moved Estimates for 1950-51 of £193 million, and a Supplementary Estimate for 1949-50 for a token sum of £10. He recalled that for the autumn exercises last year there was embarked aboard H.M.S. *Theseus*, one of our light Fleet carriers, a squadron of Fireflies of the Royal Netherlands Navy. That was indeed bringing co-operation to a fine pitch. He was also told that on one occasion during those exercises a British and a Dutch aircraft were engaged on anti-submarine patrol—both under the control of a French ship. H.M.S. *Ark Royal* would be launched very shortly, and H.M.S. *Eagle* was in process of being fitted out and should be ready next year. H.M.S. *Victorious*, which had had a hard war, was about to be modernized.

The highest research priority was being given to anti-submarine weapons for use by ships and aircraft. In the experimental stage were a number of new types of homing torpedo to be launched from the surface, from aircraft, or from under the water. A new "single packet" anti-submarine aircraft, whose initials at the moment were G.R.17, was now being developed for carrier operation. "Single packet" meant it included powers of detection and of destruction. Mr. Callaghan added, "They have deck-landed successfully already." [It is learned that the Blackburn and General Aircraft Y.A.5, powered by a Rolls-Royce Griffon, was the aircraft which Mr. Callaghan had in mind.]

No carriers had been rearmed with jet aircraft, though a flight of Vampires had been embarked in H.M.S. *Implacable* during the last autumn exercises. They had a rough trip but it was very good exercise for them, and a number of successful landings were made in rough weather. It was the intention to embark Vampires again with the Home Fleet this summer, and it was proposed to bring in the new Attacker—a single-jet with a maximum speed approaching 600 m.p.h. When jet aircraft came in in larger numbers, there ought to be an improvement in the accident rate, though Mr. Callaghan was glad to say this had been better than during the earlier years. Concerning the landing of really fast and heavy aircraft on a flight deck, he said that very successful experiments were carried out in H.M.S. *Warrior* some months ago with aircraft landing on a special flexible deck.

Air squadrons of the R.N.V.R. had completed 7,000 flying hours during the past twelve months, and the Boyd Trophy—awarded annually for the finest feat of aviation in the Royal Navy—had been awarded for last year to No. 1830 Squadron, based at Abbotsinch. Equipped with Fireflies, the squadron had completed 205 deck landings with only one minor accident. The eighteen pilots and ten observers were mostly war-time personnel, and when they embarked for flying training at sea, most of them had not deck-landed for five years. Firefly squadrons of the R.N.V.R. would fly to Malta this year to operate with the Mediterranean Fleet.

Cdr. Pursey (Soc., Hull, East) said that Mr. Churchill had advocated light carriers, a suggestion of which everyone was aware and which would be supported. Mr. Churchill had also advocated large aircraft, in particular an American type [the Lockheed Neptune—Ed.]. Could the light carriers, asked Commander Pursey, carry these large aircraft, because, if not, the suggested combination put forward by the Leader of the Opposition was worthless.

Sir Ronald Ross (Con., Londonderry) said that aircraft were certainly less effective in finding the latest types of submarines, and he was a little worried that work on the three light Fleet carriers, which he thought would have been most useful (we had no escort carriers at present) had been suspended.

Mr. Shackleton (Soc., Preston, South) said that during the war 56 per cent of all U-boats sunk were sunk by aircraft—49 per cent of them by land-based aircraft. That did not lead him to suggest that the Air Force was the answer for the future, but to say that the situation was infinitely more dangerous to-day, because the Air Force had lost the extremely offensive power which it had developed in the latter part of the war. He said that now there was a new Chief of Air Staff he would like to see a new effort made in respect of anti-submarine warfare. It was difficult to get the Air Ministry and the Air Force to think in terms of the sea. The principle in the Air Force had always been to have theatre commanders, such as in Coastal Command, while in the Air Ministry there had been merely directorates. That was different from the Admiralty system, whereby the Admiralty kept a much closer control over the tactics used and over the operations in any one area. There should be something in the Air Ministry of a higher standing than we had at the moment to provide greater emphasis and support for co-operation with the Navy in what might be one of our most serious threats.

CRANFIELD OCCASION

ON Friday last the Senior Common Room Society of the College of Aeronautics, Cranfield, Beds., held their second annual dinner.

In proposing the toast of "The College," Mr. S. Scott-Hall—who is Principal Director of Technical Development (Air), Ministry of Supply—stated that he was most impressed by the first paragraph of the College syllabus, in which it was stated that the objects were to train men in engineering and leadership. This was most encouraging, for there was a lack of highly trained engineers in this country and there was too much tendency for engineers to shun administration. No one who shunned administration could hope to become a leader. Leadership meant evoking the will to serve and it entailed persuading gifted men that one's own ideas were theirs.

In response, the Principal, Mr. E. F. Relf, thought that something extraordinary had been done in building up the College to its present stage and he felt that the foundation would have done its job if even ten per cent of its students became leaders in the real sense of the word. Training in administration was covered by the establishment of a Department of Economics and Production, which was now just over a year old. One of the most important aspects of the College, in Mr. Relf's view, was that it served as a source of supply for the Empire, and of the Empire countries, New Zealand had been consistent in sending men for the courses.

SIMPLIFYING ENGINE TESTING

A PAPER entitled *Modern Methods of Testing Aero-engines and Power-plants* is to be read before the Royal Aeronautical Society this evening by Mr. A. C. Lovesey, O.B.E., B.Sc., F.R.Ae.S.

The paper, which is very profusely illustrated, has been composed with the primary object of drawing attention to the long and costly development period of an aircraft engine, and to offer suggestions, illustrated by simple, practical examples, of means of shortening and cheapening the work.

HERE and THERE

New Gliding Plans

A TWO-SEAT sailplane designed by Hugh Kendall, chief test pilot of Handley Page (Reading), Ltd., is to be built for the 1952 series of international gliding contests. The design employs a butterfly tail unit and side-by-side seating. Three examples will be built for the British Gliding Association with funds from the Kemsley Flying Trust and a Government grant.

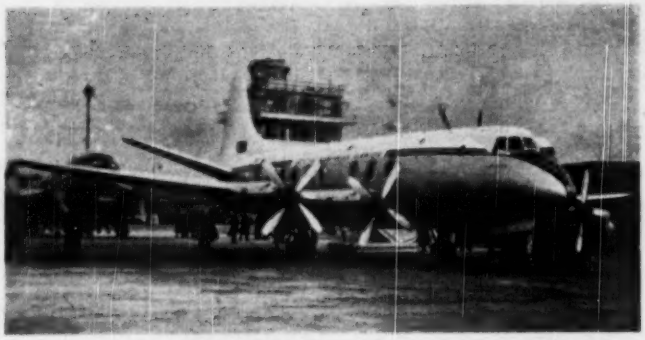
The Price of Defence

AN announcement by the Canadian Defence Minister, Mr. Brooke Claxton, revealed last week that components to be bought from America for the Canadian-built North American F-86A Sabres now in production will cost the Dominion £3,500,000. The U.S.-made items included turbojets, radio and radar equipment, and a number of unspecified parts still on the secret list. Sabres are being built at Montreal by Canadair, Ltd.

Lockheed Production

DURING 1949 the Lockheed Aircraft Corporation produced 505 aircraft (90 per cent of which were jet-powered)—an increase of 132 on the 1948 figure. Seventeen Constellations were delivered to commercial or military operators in 1949, the U.S. Navy received 51 of the remaining aircraft, and the U.S.A.F. took delivery of 437.

The company's 1950 production programme includes delivery, by this summer, of the 200th Constellation and, at the same time, production of the last F-80 Shooting Star. Constellations will be built for at least a year to come; under present contracts, P2V Neptune production lines will be at work until the autumn of 1951; the T-33 and the F-94 (two-seat versions of the F-80 for training and interception) are also in production.



THERE . . . : After setting off on its European demonstration tour, the Vickers Viscount made Holland its first port of call. Resplendent in latest B.E.A. markings, it is seen at Schipol Airport, where K.L.M. officials were among the many interested observers.

Brabazon's Testing Time

SINCE the last progress report (*Flight*, January 19th) on the flight trials of the Bristol Brabazon I, a further 44 hr 20 min have been flown, bringing the aircraft's total flying time to 73 hr 20 min. This has been achieved in 27 flights, the longest of which lasted 7 hr.

Bristol Helicopter Progress

TWO Alvis Leonides 550 h.p. radial engines will power the Bristol 175 10-12-seat feederline helicopter which, it is reported, will make its first flight in the summer of 1951. It has been suggested that B.E.A. may operate the Bristol 175 by the autumn of 1953—considerably earlier than previously forecast.

B-29s for Britain

RECEIVING on behalf of Britain the four B-29s whose arrival here is described on pages 392-3, Sir Oliver Franks, British Ambassador in Washington, described the transfer of the bombers as an example of "collective preparedness." The B-29s were formally handed over during a brief ceremony at Andrews Field, Washington, by Mr. Louis Johnson, U.S. Secretary of Defence.

Jet Inspection

AIR MARSHAL SIR W. ALEC CORYTON, Controller of Supplies (Air) at the Ministry of Supply, arrived in Stockholm last week for a seven-day visit as the guest of the Swedish Air Force. He was greeted on arrival by General Nordenskjoeld, Chief of the Swedish Air Staff. Sir Alec's itinerary during his visit included inspection of Vampire-equipped Swedish squadrons and the SAAB factories where de Havilland turbojets are built under licence.

. . . AND HERE: Several executives of K.L.M. last week visited Hatfield to examine another renowned British aircraft, the D.H. Comet. With a number of D.H. officials, the visitors were given experience of high-altitude Comet comfort after a climb through three cloud layers from a 200ft runway ceiling. Shown here are (*left to right*): Messrs. C. Bruynesteyn, F. van Broomen, H. Westerhuis, E. A. Driessen, C. Chr. Steenstra, C. S. Thom, J. J. Van Balkom, F. M. H. Lloyd, M. Sharp, R. M. Clarkson, M. Franke, I. Luymes, G. J. Malouin, F. Boisnecon, A. N. Haynes, Capt. J. Michie, Mr. A. D. Swinstead.

A VALUABLE RECORD

SO great has been the demand for extra copies of the January 26th issue of "Flight", which featured a special photogravure supplement reviewing and illustrating "Military Aircraft of the World", that it has been decided to reprint the supplement in brochure form. It is obtainable (price 1s. 6d., or 1s. 8d. by post) from Iliffe and Sons, Ltd., Dorset House, Stamford Street, London, S.E.1.

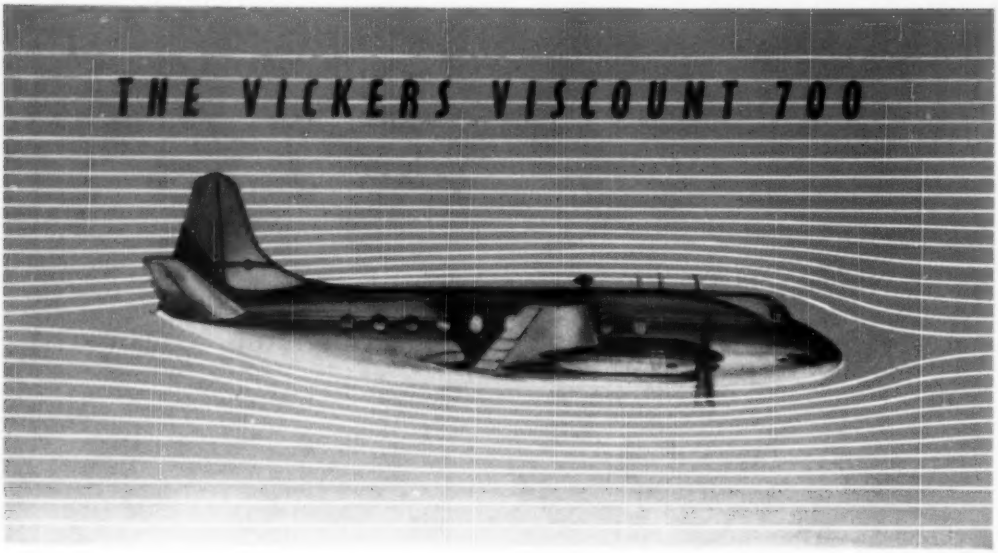
R.Ae.S. Garden Party

MEMBERS are urged by the Royal Aeronautical Society to apply at the earliest moment for tickets to this year's Garden Party at White Waltham. May 10th is the closing day for applications. Each member will be allowed tickets for three guests, and only members or their guests will be admitted. Children under five will not require tickets.

As on the occasion of last year's highly successful display, it is intended to recapture the pre-war atmosphere, with

The general capabilities of the helicopter have often been demonstrated during recent years. With the rescuing of wounded, the sick, or the stranded, from otherwise inaccessible places, the helicopter has frequently proved to be the only efficient answer in cases of emergency. The "Bristol" Type 171 is a 4/5 seater helicopter designed to permit optimum utilization in civil, industrial or military spheres. With a sound basic design, it provides full scope for modification to suit specialist requirements. Although Type 171 is the first "Bristol" helicopter, an unrivalled record of forty years of aeronautical experience is the background to its design and construction.

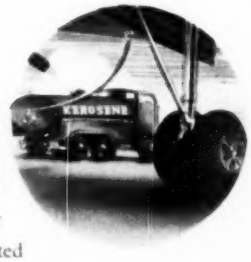
"Bristol"



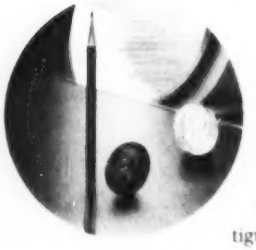
AT 68

An aircraft for the far-seeing operator

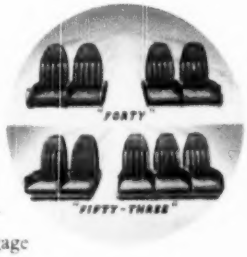
The Viscount offers four-engine safety in a medium size air liner. It has excellent handling qualities in normal conditions of flying and a first rate asymmetric performance on two engines only.



The four Rolls-Royce Dart propeller turbines use kerosene, carried in crash-proof tanks — a safety factor that will be appreciated both by passengers and crew.



Lack of vibration and reduced noise give a new high standard in air travel comfort for passengers and less fatigue for the crew. Lower airframe maintenance costs also result from the vibrationless performance.



The interior layout provides generous, comfortable and airy accommodation for either 40 or 53 passengers. Light hand-luggage racks in the cabin supplement ample freight and baggage space fore and aft.

THE FIRST PROPELLER TURBINE AIR LINER

VICKERS-ARMSTRONGS LIMITED VICKERS HOUSE · BROADWAY · LONDON S.W.1

HERE AND THERE . . .

demonstrations by light, ultra-light and vintage aircraft. Among the types expected to appear in either the flying display or the static park are a four-passenger balloon; a Deperdussin, Bleriot and Sopwith Pup from the Shuttleworth collection; a Bristol fighter; and a 1912 Blackburn monoplane.

"Fastest Bomber" Claim

THE Glenn L. Martin Company claims that its three-jet XB-51 ground-support bomber has flown at speeds "unequalled, so far as has been reported, by any other comparable type of military aircraft."

Brancker Lecture Cancelled

ORIGINALLY postponed, owing to the General Election, until April 3rd, A.V-M. D. C. T. Bennett's Brancker Memorial Lecture to the Institute of Transport has now been cancelled altogether. The Institute states that owing to pressure of business the lecturer is unable to fulfil the engagement.

Where They Went

MR. J. Freeman, Parliamentary Secretary to the Minister of Supply, recently summarized the programme of military aircraft exports between VE-day and December 31st, 1949, to nations which are not now members of Western Union or the Atlantic Pact. It was "not in the public interest," he stated, to reveal the numbers of aircraft involved.

The following types have been delivered to the countries mentioned: Lancasters and Lincolns—Argentina; Meteors—Argentina, Egypt; Vampires—Egypt, Sweden, Switzerland, Venezuela; Furys—Iraq; Beaufighters—Dominican Republic, Turkey; Hurricanes—Persia; Mosquitoes—Czechoslovakia, Dominican Republic, Sweden, Turkey; Seafires—Sweden, Turkey; Spitfires—Burma, Czechoslovakia, Egypt, Greece, Sweden, Turkey.

LUCKY NUMBER: The Fokker S-13 crew trainer, seen landing after its recent first flight at Amsterdam, has a sturdy, compact appearance which promises economy and efficiency in service. Two 600 h.p. P. and W. radials are fitted.

Meteorological Exhibition

DIRECTORS and senior officials of American and European meteorological services will be among the guests of the Director of the Meteorological Office, Sir Nelson Johnson, at the Harrow Meteorological Office, next Saturday. Apart from exhibits of both historical and modern meteorological instruments, the visitors will witness the ascent of a radio-sonde (used for recording and transmitting weather conditions at high altitude). Approximately 10,000 radio-sondes are calibrated each year and issued from Harrow to British meteorological stations and weather ships.

Radar plotting of thunderstorms, often at distances of 1,000 miles or more, will also be demonstrated, and weather forecasts will be issued. The visit has been organized as part of the centenary celebrations of the Royal Meteorological Society.

NEWS IN BRIEF

THE opinion of *Flight*, expressed in a recent article, that "the Canberra sets a new standard among contemporary military types," was quoted by the chairman at the recent annual general meeting of the makers—the English Electric Co., Ltd.

* * *

Acheson Colloids, Ltd., have moved to 18-19, Pall Mall, London, S.W.1 (Whitehall 2034-7).

* * *

By arrangement with the Glenn L. Martin Co., the Loewy Engineering Co., Ltd., Manfield House, 376, Strand, London, W.C.2, is to introduce the Marform precision metal-forming process into the United Kingdom, the British Commonwealth, Europe and other export territories. Both complete presses and conversion equipment will be supplied by Loewy Engineering, who will manufacture it at their works (Light Machines, Ltd.) at Yeovil.

SHORT CIRCUIT: The Second Sea Lord, Vice-Admiral Sir Cecil Harcourt (right), recently made a tour of the Short Brothers and Harland works at Belfast, where he inspected Sturgeon target-towers in production for the Navy. Accompanying him were (left to right): Commodore C. A. R. Shillington, Mr. George Gedge and Rear Admiral M. S. Slattery (managing director of Short's).

A Beechcraft T-34 Mentor single-engined trainer will be demonstrated to air force authorities in Switzerland for almost the whole of next month. Before returning to America, Beechcraft test pilot Claude Palmer will demonstrate the Mentor in Egypt for a further two weeks.

* * *

In the caption to a photograph of the teams of the Aero Golfing Society and R.A.F. Golfing Society published last week, the second player from the left should have been named as A. Cdre. H. D. Jackman and not, of course, as W/C. K. A. Jackman, who is his brother.

* * *

The latest addition to the Cellon range of aircraft finishes, a pre-treatment primer approved under D.T.D.900, is the subject of a booklet issued by Cellon, Ltd., Kingston-on-Thames. Without actually keying into the metal surface, the primer provides a corrosion-resisting film and a good foundation for finishing coats.

* * *

At the recent annual general meeting of Marconi's Wireless Telegraph Co., Ltd., Sir George H. Nelson (chairman) said that Marconi equipment was installed on B.O.A.C.'s 22 Argonauts, and would be fitted in the Hermes IV, the B.E.A. Ambassadors, and the Comets. In the two last-named types, the aerial systems would be entirely enclosed in the airframe structure.

* * *

British Insulated Callender's Cables, Ltd., announce the appointment of Mr. W. H. McFadzean, C.A., deputy chairman to the post of chief executive. Other B.I.C.C. appointments include those of Dr. L. G. Brazier, Ph.D., B.Sc., M.I.E.E., A.F.R.Ae.S., F.A.I.E.E., and Mr. H. J. Stone, M.C., M.I.E.E., to the board. Dr. Brazier was a 1914-18 war pilot, and was subsequently engaged in research work at the R.A.E., Farnborough; he joined Callenders in 1925.

CIVIL AVIATION NEWS

WHILE YOU WAIT : This photograph of the arrival at Kastrup airport was flown back to Hatfield in the D.H. Comet which, as described on this page, established (subject to confirmation) its third international point-to-point record last week.

COMET'S THIRD RECORD

ON March 21st the de Havilland Comet paid another one of its lightning calls on Continental capitals; this time it flew from Hatfield to Copenhagen covering the 590 miles in 1 hr 18 min 36.5 sec, at an average speed of 453.98 m.p.h. Although officially a test flight, the trip will rank as a capital-to-capital record, subject to F.A.I. homologation. There were 24 people, including a crew of six, on board the aircraft, which took off from Hatfield at 9.58 a.m. and was immediately picked up by London Radar; two minutes later it swept across London Airport at low level, where officials of the R.Ae.C. were waiting to take the starting-time for the flight. The Comet was visible on the long-distance radar screens for 125 nautical miles, flying at approximately 30,000 ft.

On arrival at Kastrup, G/C. John Cunningham with the crew and passengers (mainly representatives of the national Press) were greeted by the British Ambassador and officials of S.A.S.; they were later entertained at a luncheon in Copenhagen.

After being refuelled by B.P. Aviation Service with 1,000 gallons of aviation turbine fuel, the Comet left on the return journey at 4 p.m., crossing the timing-line at London Airport at 5.37 p.m. after flying at an average of 417 m.p.h. The passengers reported an extremely comfortable trip, most of which was flown at about 32,000 ft. Cabin pressure was equivalent to only 12,000 ft, and the almost complete absence of vibration was very noticeable in spite of the fact that the Comet has only temporary soundproofing. B.E.A. scheduled time for the London-Copenhagen service is approximately 3 hr.

THE CORPORATIONS IN 1949

LAST Saturday's statement—published by the M.C.A.—of operating and traffic statistics for the British Airways Corporations in the calendar year 1949 (as distinct from the financial year ending on March 31st) reveals overall traffic increases for both B.O.A.C. and B.E.A. The total of passengers carried rose by nearly 30 per cent to 917,000 from 713,000 in the calendar year 1948. Passenger-mileage increased by 11 per cent, and freight and mail ton-mileage by 17 per cent and 6 per cent respectively. Although the capacity ton-mileage was 17 per cent higher than in the previous year, the figure for aircraft-miles-flown showed a slight decline, partly due to the introduction of larger capacity aircraft in B.O.A.C.'s fleet. Compared with the first nine months of the financial year 1948-49, the figures show that the Corporations and their associates flew approximately 50 million passenger miles more in this period of the current financial year. The number of passengers carried increased from 600,000 to nearly 800,000, while the tonnage of mail and freight showed increases of 21 and 84 per cent respectively.

The detailed figures for the calendar year 1949-50 reveal that, of this general improvement in traffic, B.E.A. enjoyed the lion's share. In capacity ton-miles and passenger-miles flown, B.E.A. showed increases of 37.7 and 33.4 per cent, while B.O.A.C.'s figures were 11 and 0.7 per cent respectively. B.E.A.'s mail ton-mileage rose by 67.2 per cent, while that of B.O.A.C. decreased by 0.2 per cent; freight ton-mileage figures rose by 26.8 and 13.3 per cent for B.E.A. and B.O.A.C. respectively. A detailed analysis will appear in *Flight* next week.

Although the financial year 1949-50 does not end until tomorrow, the extent of a supplementary estimate, introduced last week by the Parliamentary Secretary to the Ministry of Civil Aviation, Mr. Frank Beswick, reveals further heavy losses by B.O.A.C. Mr. Beswick said in the House of Commons that the grant was originally estimated at £3½ million and that the additional requirement would be £3,057,000. Although this would not be the total amount of the Corporation's deficit for the current financial year, it was the maximum that the Exchequer could be asked to meet; there would be no additional burden on the taxpayer, however, because of savings effected by M.C.A. in other directions. He stated, "the year 1949-50 has been a difficult one, and the financial results are most disappointing. Devaluation has caused a net increase in the deficit of £650,000. . . the biggest and unhappiest item was £1,750,000 caused by the decision to withdraw Tudors from South American services." Late deliveries of replacement aircraft had been another major cause of the Corporation's difficulties.

Although it will be some considerable time before any large-scale financial improvement is actually apparent it is to be hoped that the introduction of Hermes and later, of Comets, on the Corporation's routes will colour the monetary picture in somewhat happier tones.

SCANDINAVIAN EFFORT

THE most extensive timetable ever to be announced by S.A.S. will take effect from April 16th. A number of new services, frequency increases and time reductions on existing flights are included in the new schedules. Perhaps the most outstanding feature of this Scandinavian bid for increased traffic is the introduction of a low-fare night return service, to be flown by DC-4s between Copenhagen and Paris. The flight will leave Copenhagen just before midnight, arriving at Paris 3½ hr later, and on the return flight will reach Copenhagen at daybreak. The return fare is 125 per cent of the normal single rate. Another night service is to be flown non-stop from Copenhagen, on which fare reductions are also being made. New routes will be added, one from Oslo *via* Copenhagen, Hamburg and Frankfurt to Madrid, and another from Cairo to Copenhagen *via* Rome. From May 15th, the frequency of the Copenhagen-North America service is to be increased to

nine flights weekly, two of which will stop at Hamburg DC-6s will be used on this route.

Among many other changes, the night stop in Rome is being discontinued on the two DC-6 routes from Persia and East Africa to Scandinavia. On April 17th a route is being opened to Tromsö, using Sandringham flying-boats, which, after May 15th, are being diverted so that passengers on this service will be able to enjoy one of the most spectacular scenic flights in Europe "by the light of the midnight sun" before landing at Kirkness. Under the new timetable Rome has become one of the main traffic centres, and is now almost a secondary "hub" of the S.A.S. intercontinental network. The overall number of services being offered is 20 per cent greater than last year's figure.

With this bold policy of increased capacity in 1950, and the recent move to centralize and generally streamline its administrative structure, it is apparent that S.A.S. is making a very determined effort to improve on the unsatisfactory financial results of the last two years' operations. Incidentally, the first production SAAB Scandia was delivered to S.A.S/A.B.A. and Bromma airport on March 13th.

WORLD FARE CHANGES

AS the result of the increased cost of fuel, aircraft spares and maintenance of bases, due to devaluation, major alterations in airline fares and cargo rates throughout the world were implemented on March 22nd. The general effect of the new fare structure—which was recommended at the last I.A.T.A. Traffic Conference, held at Mexico City—is that fares and freight rates on routes to Africa, the Middle East and the Far East from points in Europe have been increased by amounts up to 10 per cent. On the North American routes, however, basic fares will be unchanged, while in some cases cargo rates will even be reduced.

To encourage the public to fly during periods outside the busiest season, a new transatlantic fare structure has been introduced, lower fares being charged on both east- and west-bound Atlantic crossings. Thus travellers whose bookings avoid the peak of the Holy Year tourist season can fly at a considerably reduced rate. While the discount periods on east- and west-bound services are slightly different, the new schedule makes it possible for a passenger to make the transatlantic crossing at the reduced fare during seven of the twelve months of the year. All tickets will be valid for twelve months. Broadly, three different round-trip rates for the north Atlantic route have been established—one when both flights are made during the peak traffic season, the second when both flights are made during the off-season period, and thirdly, when a flight is made one way during the peak season and the return during the less-busy months. On east-bound flights, full fares will be charged from April to August, while the lower rates are effective from September to March. In the other direction, full fares are effective from July to November, and reduced rates from December to June.

The following examples indicate the substantial savings which can be achieved by travelling when traffic is lighter. From New York to London, the round-trip fares will be $630 in the peak season, $466 in the off-season and $548 when travelling in both seasons. Fares between other points vary in proportion. The new fare structure has been approved by all member-airlines of I.A.T.A.

TRADE FLIGHT: The smiles of the party boarding the Vickers Viscount before its departure from Northolt suggest confidence in the commercial outcome of its European Tour. Left to right are Mr. B. W. A. Dickson, general manager, Vickers Armstrong (Aviation), Ltd.; Lord Douglas of Kirtleside, chairman of B.E.A.; Sir Hew Kilner, Vickers Aviation managing director; Lady Kilner; and Mr. Peter Masefield, chief executive of B.E.A.

FOR AUSTRALIAN NAVIGATION

REPRESENTING a major advance in the efficiency of Australia's air-navigation aids, the installation of visual-aural radio-ranges throughout the Commonwealth is now almost complete, and it is expected that this type of equipment will be in full use by June of this year. The new system is designed to give much better coverage for Australian routes and provide a more reliable guide than the present 33 mc/s range network. Additionally, it will give visual as well as aural indications to the pilot, mark out four courses instead of only two from each range station, and—perhaps most important—eliminate the present difficulty of reflected interference between broadcasting stations.

Although the network of transmitters is almost complete, it is likely to be some little time before all operators will have fitted the requisite airborne installations, and in the interim period the visual-aural system and the 33 mc/s ranges may be worked jointly to meet operating requirements. The cost of the entire programme is estimated at approximately £A4,000,000.

AER LINGUS' EXPECTATIONS

AER LINGUS' summer schedules, which will be effective on April 16th, provide for an increase in services of almost 20 per cent over the number operated in the same period last year. On the Dublin-London route, which carries by far the larger proportion of traffic, services will increase from an average of 56 per week in April to 72 per week during the peak of the season. The traffic is expected to be heaviest on this route in mid-week; to cater for it, 13 round trips daily will be flown on certain days in July, August and September.

Advance bookings already received indicate that the Dublin-Glasgow route will carry a record number of passengers. The Dublin-Birmingham route, inaugurated only last year, will have twelve flights per week instead of the present six. Frequencies on the Dublin-Liverpool and Manchester services will also be increased considerably, that of the former to as much as 36 per week during August. A three-times-weekly all-cargo service to London will be introduced on June 1st. No increase is being made in the size of the Aer Lingus fleet, but the company is aiming at increased utilization of existing aircraft.

CHARTER RATES

IT is the view of the Airbrokers' Association that undercutting of rates by some British operators is one of the major factors in the current difficulties in which the companies find themselves. Commenting on a paragraph, "The Charter Trail," which appeared in these columns last week, Mr. J. L. Logan (secretary) says that, in the Association's opinion, the reasons for the present unsatisfactory state of affairs are, in the first place, the well-known ones (the Air Corporations Bill, restrictive practices by foreign Governments, and the general attitude of scheduled airlines to charter operations), and in the second place "the severe undercutting of freight and passenger rates by a proportion of our own charter operators, either because of hastily conceived policy or, more likely, through an imperfect knowledge of current market conditions."

Many of their members, says Mr. Logan, have found that, although during the last few months some Dakota operators have confined their quotations to sound economical rates, there are usually one or two operators who put up quotations "so ridiculous" that they undercut other quotations by as much as 30 to 40 per cent. He instances a flight to East Africa, when, though quotations were about 3s 10d per mile, one operator is said to have quoted at 2s 6½d. Similar instances during the past two weeks have occurred in connection with flights to Holland, North Italy and West Africa.

The rates around 3s 10d to 4s per mile are low enough, in the view of the Association, but they are winter rates only for

CIVIL AVIATION NEWS . . .

cargo, and the operators concerned are working on a more substantial basis for the coming season. The airbrokers of the Baltic Exchange are convinced that they have a good market for the chartering of aircraft, both for cargo and passenger flights.

"Rates in any market fluctuate," adds Mr. Logan, "but bear a mean relation to the current conditions. Aircraft operators can compete by the shading of their quotations or by offering better conditions, but the wholesale slashing of prices is not only suicide for the company quoting but causes needless depression of the market generally and eventual elimination even of the soundest operators."

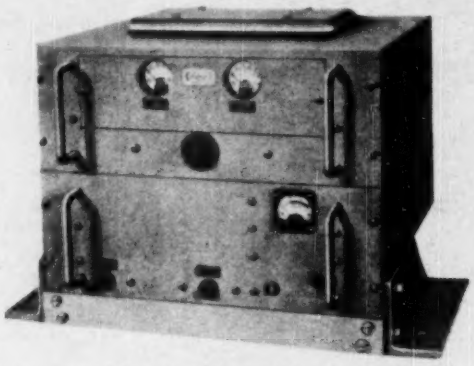
NEW GROUND TRANSMITTER

DESIGNED originally to meet airport local-control requirements, a 12-watt V.H.F. transmitter introduced by the Plessey Co., Ltd., should have a wide field of application wherever a compact fixed-station transmitter with an R-F. power output of this order is required. The complete equipment, known as the Type PT. 10, consists of a modulator and an R-F. unit conveniently mounted for desk operation in a rigid steel frame. Where preferred, however, these units may be mounted otherwise—in a standard rack, for instance—with a suitable receiver and loudspeaker unit, to form a complete transmitter-receiver installation.

Covering the 118-132 mc/s frequency band, the operating frequency of the transmitter can be varied by insertion of the appropriate crystal. It is then necessary only to tune for a maximum or minimum meter reading, according to the stage concerned. Frequency stability complies with international requirements.

Operation is simple, band-pass circuits in the R-F. unit minimizing the necessary tuning controls, and a pre-set circuit in the modulator unit automatically preventing over-modulation. Servicing, too, is simplified by switched two-meter indication of each stage in the R-F. unit, test points being provided to cover all other sections.

The equipment, which is claimed to be extremely economical on both "Stand-by" and "Transmit" positions, operates from a 230-volt 50-cycle supply.



The Plessey Type PT.10 12-watt V.H.F. transmitter referred to on this page. The equipment consists of a modulator and an R-F. unit, shown here in a desk-mounting frame.

BREVITIES

OFFICIALS of the Ministry of Civil Aviation arrived at Auckland from Australia on March 17th for discussions with New Zealand Government representatives. The British mission is led by Mr. C. W. Evans, C.B.E., Under-Secretary for Finance, of the M.C.A.

* * *

In addition to the order for 30 Martin 4-0-4s (referred to in *Flight* of March 16th), T.W.A. has completed arrangements for leasing twelve 36-passenger 2-0-2s from the Glenn L. Martin Company for delivery in July. The aircraft will be put into service on T.W.A.'s medium- and short-haul internal flights to supplement the existing fleet of 61 Constellations.

* * *

Just seven days after it was damaged during a "belly-landing" at Hurn Airport, the Airspeed Ambassador was flown back to Christchurch following temporary repairs to the fuselage and replacement of one damaged airscrew. The makers point out that the confinement of damage to such a small area is a particular advantage of the high-wing layout.

* * *

B.O.A.C. announces the resignation of Mr. Eric Nelson, Western Regional Operations Director; he is to join the staff of Canadair, Ltd., in Montreal. Mr. Nelson was previously deputy general manager of B.O.A.C.'s former Western Division, and was at one time technical adviser to the Director-ate of Air Services at Hong Kong, where he played an important part in the development of Kai Tak airport.

* * *

The second S.O.95 Corse (the French twin-engined transport), ordered by Air Services of India, Ltd., left Toussus for Bombay two weeks ago. The first aircraft (an 11-passenger version) has completed 300 hr of operating trials over the company's routes. In spite of the unfavourable monsoon conditions the S.O.95 is said to have given complete satisfaction, the block speeds of 324 km/hr (203 m.p.h.) which were achieved were better than those previously envisaged by the manufacturers.

* * *

United Air Lines appear to have revised their former reserved attitude towards "air coach" services, for they have now signified their intention of applying for permission to operate such a service on the Los Angeles-San Francisco-Oakland route. The proposed tariff will be filed with the C.A.B. on March 30th, and the service will be inaugurated on May 14th. DC-6s, converted to carry 70 passengers, are to be used on the projected three round-trips daily. Fare reduction is approximately three cents per mile.

The chairman of B.O.A.C., Sir Miles Thomas, flew to Lisbon last week in order to review the local traffic situation. His visit follows B.O.A.C.'s recent reintroduction of the Central Atlantic service operated with Constellations, which now offers additional capacity on the flights passing through Lisbon.

* * *

The first through service between Canada and the southern states of the U.S.A. will be inaugurated on April 2nd, when T.C.A. will fly a 5½-hr schedule between Toronto and Tampa, Florida. The new service will also provide direct connections between Florida and the islands of Jamaica and the Bahamas.

* * *

The Inter-American Safety Council's award for accident-free flying in the western hemisphere has been won by K.L.M. for the seventh year in succession. The company's West Indies division flew some 2,698,653 aircraft-miles (almost 39 million passenger-miles) in 1949 without accident or fatality to passenger or crew.

* * *

The Scottish Advisory Council has announced excursion fares by B.E.A. from Edinburgh and Glasgow to Rome for the Holy Year celebrations. Passengers from Scotland change aircraft at Northolt, and the service, which began on March 22nd, is operating twice daily. The Council has also decided to ask B.E.A. for an experimental summer service to link Renfrew, Perth and Aberdeen.

* * *

Australian Airline pilots have expressed dissatisfaction at the present method of efficiency checking by the Civil Aviation Department. They claim that the examiners (mainly ex-R.A.A.F. instructors) have no opportunity to gain the experience befitting their duties. Though each airline employs a staff of qualified senior captains whose job is to test periodically the efficiency of the company's pilots, even the seniors have to submit to checks by an examiner with no comparable experience in airline flying.

* * *

Central African Airways' traffic last January showed a slight increase over that for the corresponding month in 1949. The total of revenue passenger-miles flown increased by some 289,000, and the passenger load-factor on scheduled services rose by 7 per cent. Increases in the carriage of freight and mail amounted to 5,140 and 6,800 kg respectively. As an index of the improved efficiency which has been achieved, the usable capacity ton-miles flown per employee rose from 679 to 811, while the revenue ton-miles flown per employee in-

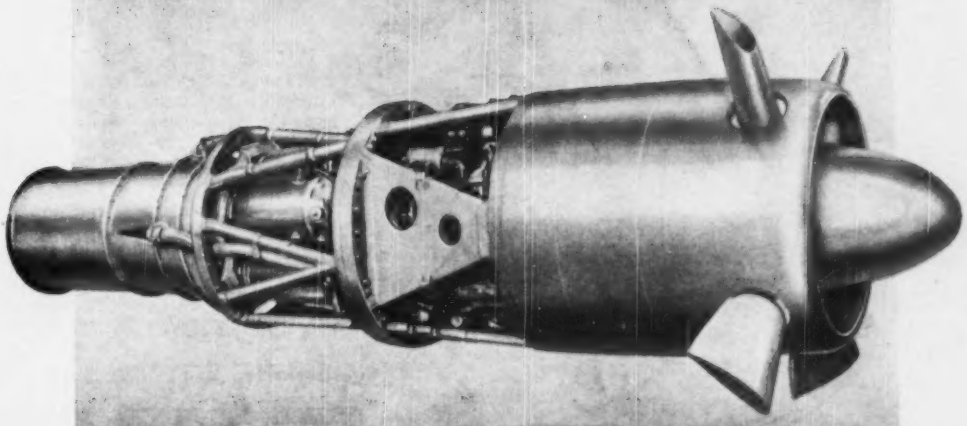
NAPIER NAIAD

PROPELLER TURBINE ENGINE

TOTAL E.H.P. — 4590

WEIGHT — 1095 LBS.

DIAMETER — 28 INCHES



D. NAPIER & SON LIMITED LONDON W.3

MESSIER *Flow Divider*

The Canberra "B"
MARK ONE

The air brake flaps on this outstanding English Electric aircraft are operated by two Messier hydraulic jacks synchronised by a Messier flow divider.

THE MESSIER FLOW DIVIDER ALLOWS THE ACCURATE SYNCHRONISATION OF TWO HYDRAULIC JACKS WITHOUT MECHANICAL INTERCONNECTION OF THE TWO FLAPS, IRRESPECTIVE OF THE RELATIVE LOADS ON THESE FLAPS; A HIGH DEGREE OF ACCURACY IS ACHIEVED EVEN WITH CONSIDERABLE DIFFERENCE IN LOAD ON THE TWO JACKS.

BRITISH MESSIER LTD · GLOUCESTER

CIVIL AVIATION NEWS

creased from 437 to 565. In January, 1950, the overall revenue load-factor (69.7 per cent) was a record for the company; it was a particularly creditable figure in view of the fact that it included the weight of excess fuel carried.

* * *

The ten-day strike which recently forced American Airlines to reduce its operations by 80 per cent ended last week. The 4,500 maintenance workers involved gave up their demands for a general wage increase by an overwhelming vote and decided to return to work. Normal services are in operation.

A daily service to Havana from the principal cities of South America is now being offered by Panagra as the result of an agreement made last month with P.A.A. Passengers can now make connections at either Miami or Havana for flights to Washington and New York.

* * *

The Avro Jetliner is reported to have flown the 292 miles from Toronto to Ottawa in 36 minutes (an average speed of 418 m.p.h.); the T.C.A. routine service between these two points is scheduled to take 1 hr 40 min. On April 19th the aircraft will visit the aviation show which is being organized in New York by the Society of Automotive Engineers.

FROM the CLUBS

OF interest to private owners and clubs is the A.R.B. announcement that the overhaul life of the Cirrus Minor 90 h.p. Series I engine has been extended to 800 hr without the need for any intermediate top overhauls. The A.R.B. has actually sanctioned the running of a number of engines to 1,000 hr, and the manufacturers (Blackburn and General Aircraft, Ltd.) hope that approval will soon be forthcoming for this figure on all Series I Minors. The Cirrus Minor II has already been extended to 800 hr and, similarly, several of them are now being run to 1,000 hr.

* * *

FOR the convenience of members living in the vicinity of Booker the Wycombe Flying Club has arranged for an Auster to be available for instruction at Booker airfield on alternate Sundays.

The C.F.I. has now been appointed a Royal Aero Club observer so that tests for Aviators' Certificates and Private Pilots' Licences can be carried out at Blackbushe. The Auster 1 is available for hire on week-days at a flat rate of £2 10s per day, plus 10s per flying hour. The hourly charges are from £1 10s solo.

The club is now seeking to hire a Tiger Moth or a Magister at a reasonable rate to give members some experience on a more sporting type than the Auster. New members will be welcomed, and those interested should contact Mr. D. Ogilvy, 9, Imperial Road, Windsor, Berks.

* * *

THE enviable status now enjoyed by private pilots in France is emphasized in this month's bulletin of the Ultra Light Aircraft Association. The French Government has decided to promote and develop a popular aviation movement, and to this end has established a department ("S.A.L.S.") for the purpose. An order was recently placed by this office for three prototypes of 45 h.p. two-seat light aircraft. This move is intended to promote "approved" aircraft types which can be constructed by amateurs and in club workshops. An attempt to achieve such a purpose in this country failed when the Ministry of Supply flatly refused a similar application from the U.L.A.A. Aircraft construction by amateurs is thus officially recognized in France, and the less fortunate U.L.A.A. groups are expressing concern at the lack of official support which the movement is receiving in England.

The three French prototypes (of which the most advanced is the Maurice Brochet M.B.70 high-wing monoplane) will pass through the Government's flight-testing establishment at Bretigny, and will have to qualify for a normal C. of A. The Government will also supply the engine required—in this case the 45 h.p. Salmson radial. Material and accessories will be available at a very low cost, and steps have been taken to ensure that all insurance rates will be at a minimum. The French Government hopes that, at a fractional cost to the taxpayer, an extensive revival of the private and club flying movements will be seen within a year or two.

* * *

NEWS from the Wiltshire Flying Club shows that during February the total of flying amounted to 51 hr. From January 1st to March 1st the total was 246 hr, which compares favourably with last year's figure. A further reduction in flying rates for the two-seat Auster has been made to encourage members to put in as much flying time as possible during the early spring.

A total of 50 hr solo is being offered at £2 per hour on condition that a minimum of five hours is booked and paid for in advance, and that the whole 50-hr period is completed before June 1st. There are thus ten 5-hr periods available to members, and these will be allotted strictly in the order in which payment is received.

At the motor cycle race meeting which is being held at Thruxton airfield on Easter Monday there will be a delayed parachute drop by Mr. J. E. Gwynne-Johns and demonstrations by private aircraft. The proceeds of the meeting will be divided between the motor cycle club and the Wiltshire Flying Club. In view of the material assistance which the flying club should thus receive all members are requested to assist in running this meeting.

The club is now offering five aircraft—three Austers, a Proctor and a Messenger—for sale.

* * *

THE Lancashire Aero Club has announced new charges for daily hire, effective from March 1st. An initial hiring fee of £5 is being charged regardless of the length of time for which the aircraft is away. In addition, a daily charge of £1 10s per day from Mondays to Fridays, and £2 10s per day at week-ends, is being made. For any flying in excess of twelve hours, 7s 6d an hour will be charged to cover maintenance. The initial hiring fee will, however, be reduced to £3 for single-day periods provided the aircraft is returned by 5.30 p.m. Night-flying at Ringway is now available at £4 per hour.

After lengthy negotiations, permission for full bar facilities has now been obtained for the new club-house; at the moment the facilities are restricted to Saturdays and Sundays, or to week-days for which special functions have been arranged. The competition for the Crossley Trophy, over a cross-country course, is being held between March 4th and May 6th; further particulars can be obtained from the secretary.

* * *

IN February, the Cambridge Aero Club flew 127 hr, including 4½ hr at night. One Private Pilot's Licence was awarded and another member carried out his first solo. Two new instructors joined the club—Mr. J. Hamilton, from Shoreham airport, and Mr. K. Clark, who was previously employed by Scottish Aviation.

FORTHCOMING EVENTS

March	30	R.Ae.S.: "Testing Aero Engines and Power Plants," by A. C. Lovesey, O.B.E., B.Sc., F.R.Ae.S.
April	1	British Interplanetary Society: "Space Travel—Fact and Fiction," by A. C. Clarke, B.Sc.
April	1	Aircraft Golfing Society: Captain's Prize Laleham G.C.
April	3	R.Ae.S. (Derby): "Testing Engines and Power Plants," by A. C. Lovesey, O.B.E., B.Sc., F.R.Ae.S.
April	4	R.Ae.C.: Film Show, Londonderry House.
April	4	R.Ae.S. (Belfast): Annual General Meeting.
April	5	R.A.F. Golfing Society: Match v. Greyhound Racing Association.
April	5	R.Ae.S. (Bristol): "Aircraft Production and Engineering," by Prof. J. V. Connolly, B.E., A.F.R.Ae.S.
April	5	R.Ae.S. (Brough): "Flying-boat Design Problems," by H. Knowler, A.M.I.C.E., F.R.Ae.S.
April	7	R.Ae.S. (Portsmouth): "Aircraft in Future Warfare," by Air Marshal Sir Robert Saundby, K.B.E., C.B., M.C., D.F.C., A.F.C.
April	8	British Interplanetary Society (Manchester): Film Show.
April	12	R.Ae.S. (Reading): "Flying Boats," by H. Knowler, F.R.Ae.S.
April	13	R.Ae.S.: "The Berlin Air Lift," by A. Cdre. J. W. F. Merer, C.B.
April	13	Guild of Air Pilots and Air Navigators: Annual General Meeting.
April	18	Aero Golfing Society: Instone Cup Meeting.
April	19	Institute of Transport: Informal Luncheon. Speaker: Sir Miles Thomas, D.F.C.
April	19	R.Ae.S. Graduates: "Training of Aeronautical Engineers." (Discussion: chairman, Marcus Langley, F.R.Ae.S.)
April	21	Institute of Navigation: "Dynamics of Space Flight," by A. C. Clarke; "Interplanetary Navigation," by Dr. R. d'E. Atkinson.
April	25	R.Ae.S. Section Lecture: "Flight Refuelling and the Problem of Range," by C. H. Latimer Needham, M.Sc., F.R.Ae.S.
April	25	R.Ae.C.: Film Show, Londonderry House.
April	26	R.Ae.S. (Preston): Annual General Meeting.
April	27	R.Ae.S.: "High-speed Research in the Aerodynamics Division of the N.P.L.," by J. A. Beavan, M.A. (Cantab.), A.F.R.Ae.S. and D. W. Holder, D.I.C., A.C.G.I., B.Sc. (at Manchester).

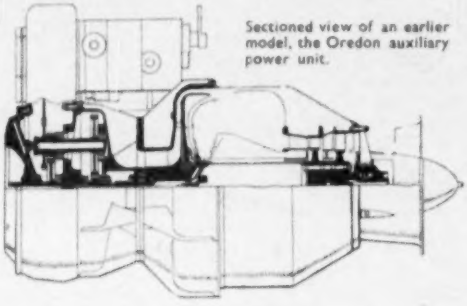
FRENCH TURBOPROP TYPE-TESTED

Lightweight Unit Delivers 220 h.p.

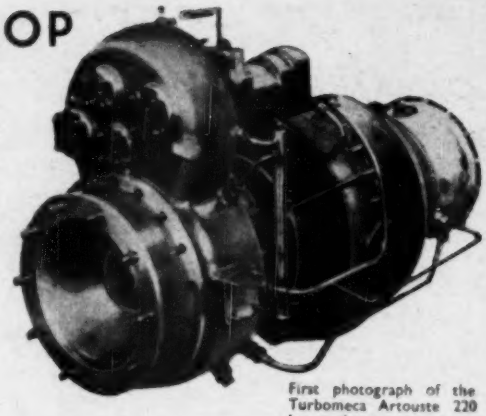
ENCOURAGED, no doubt, by the successful progress of the Piméné miniature turbojet, the French Turbomeca company has vigorously pursued the development of its other light turbine designs. Reference has previously been made in *Flight* to the 140 h.p. Turbomeca TT-782 Oredon, an earlier unit than the Piméné, intended for driving auxiliaries in large, high-flying aircraft.

From the Oredon has been developed a new 220 h.p. turboprop, the Artouste, which recently completed a 150-hr endurance test under I.C.A.O. conditions. The test period was divided as follows: at max power (220 h.p.)—15 hr; at max continuous cruising (180 h.p.)—75 hr; at cruising power (162-180 h.p.)—45 hr; idling (30-40 h.p.)—15 hr.

Total weight of the new unit is 194 lb. Its leading dimensions are: diameter, 16in; length, 32in. Like its predecessors, the Artouste is claimed to be capable of running, without modification, on petrol, kerosene, alcohol and a number of other fuels.



Sectioned view of an earlier model, the Oredon auxiliary power unit.



First photograph of the Turbomeca Artouste 220 h.p. turboprop.

Internal arrangements of the new turboprop have not yet been revealed, but are likely to correspond with those of the Oredon shown in the accompanying drawing. Weighing 185 lb, the Oredon has a designed rating of 140 s.h.p. at rated r.p.m.

All three Turbomeca light power-units employ a single-sided centrifugal compressor feeding air into an annular combustion chamber. The Oredon is seen to have a two-stage turbine as opposed to the Piméné's single-stage component. The simplicity of the Turbomeca fuel system is a unique feature of the Piméné and Oredon, and has presumably been employed in the Artouste. Kerosene is fed into the front end of the hollow mainshaft by a single delivery jet. It then passes into the combustion chamber via a centrifugal injection wheel attached to the shaft, which has holes spaced around its periphery. The need for any form of high-pressure delivery system is therefore obviated. For accessory drives, the Oredon, which runs at 36,000 r.p.m., employs a reduction gear with a ratio of approximately six to one.

ARMY versus R.A.F. RUGBY

SUPPORTERS of the R.A.F. hoped hard and kept their fingers crossed when, at Twickenham on Saturday, half-time came with no score for either Air Force or Army. Although on occasions the Army outsides had shown both skill and determination they had not 'lived up to their reputation, and good R.A.F. defence and kicking had kept them in check. The second half, however, saw little of the muddling and inaccurate passes, and the Army, who were playing six internationals, were able to win decisively by a goal and two tries to the R.A.F.'s penalty goal. 'Smailes' kick, which secured the R.A.F.'s three points, was remarkable, being placed centrally but some ten yards inside his own half. A medium tail-wind helped, but it was a place kick of a decade.

The first half was played at a great pace, and the forwards of both sides were in great form. Keeling of the Army hooking with the greater success. On both sides the ball showed a tendency to stick in the back row. For the R.A.F., Hay and Roberts, the halves, and Austin-Smith in the centre, did some excellent kicking, often making many yards from difficult angles. The powerful Army line looked very dangerous, but mistakes were made and the R.A.F. took good advantage of them. The R.A.F. outsides moved smoothly but seldom looked like breaking through.

On the Army left, Reeve and Hyde were a forceful partnership, and Hardy, with a tremendous acceleration, showed on several occasions how hard he is to catch or pull down. In the second half it was these outsides who made the first try together, Hyde diving over the line. The astonishing R.A.F. penalty followed at once, then Reeve, with Hardy's aid, scored again for the Army, going very hard as usual. This try was well converted. The final try came to the Army through quick following-up and a modicum of good fortune. Phipps, not for the first time, ran well away and touched down. Hardy again failed with the kick.

Thus, having already beaten the Royal Navy (the R.A.F. drew 6 pts all), the Army become this year's inter-Service champions. Last year they shared the honour with the R.A.F.

Royal Air Force.—*Full-back:* F/L. A. A. Smailes (Brize Norton). *Three-quarters, l. to r.:* A/C. D. H. Phillips (Watnall), F/L. R. J. Uprichard (Marham)*, F/L. R. D. Austin-Smith (Flying Training Command), W/C. B. P. Young (Air Ministry). *Stand off:* Sgt. T. L. Roberts (St. Athan). *Scrum half:* F/L. W. T. H. Hay (Cranwell). *Forwards:* F/L. R. V. Stirling (Waddington), Off. Cdt. A. H. Rennie (Ternhill), F/O. T. V. Backthought (St. Athan), Cpl. E. E. Rossiter (Sutton Coldfield), P/O. S. T. H. Wright (Cardington)*, F/L. H. K. Rees (Cambridge U.A.S.), S/L. R. H. G. Weighill (Cranwell)* (Captain), Off. Cdt. S. D. Little (Wittering).

The Army.—*Full-back:* Lt. J. M. H. Roberts. *Three-quarters, r. to l.:* Pte. D. M. Scott*, 2nd Lt. G. C. Phipps*, 2nd Lt. P. B. Reeve, Pte. J. P. Hyde*. *Stand off:* 2nd Lt. E. M. P. Hardy. *Scrum half:* 2nd Lt. D. W. Shuttleworth. *Forwards:* Capt. A. G. C. Jones, Lt. J. H. Keeling*, Capt. J. L. Baume*, Maj. F. H. Coutts* (Captain), Maj. B. A. Neale, 2nd Lt. R. F. Dorey, Capt. D. E. Iles, L./Cpl. R. Cross.

* International.

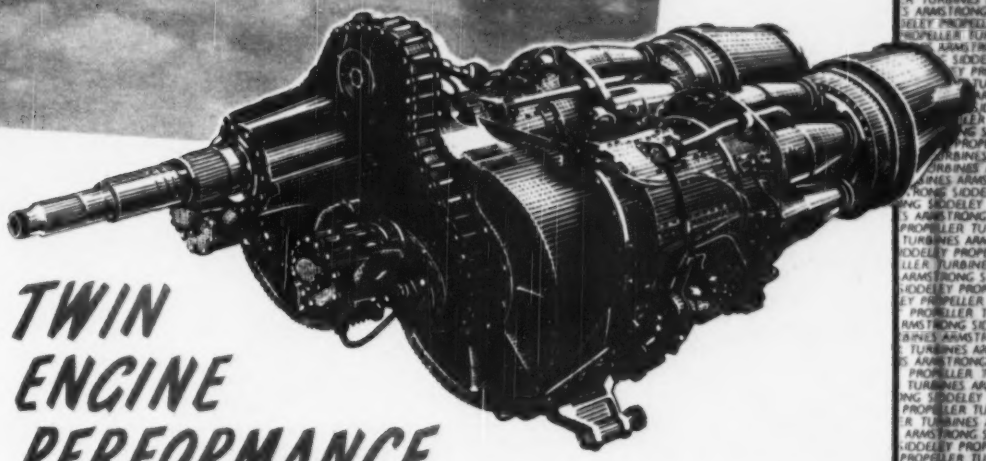
FLIGHT-TESTING OF HELICOPTERS

THOSE aspects of helicopter flight development which are most closely concerned with type-testing and the investigation of operating techniques formed the subject-matter of a most comprehensive paper, *Flight-testing of Helicopters*, presented by Mr. F. O'Hara, M.A., before the Helicopter Association of Great Britain last Saturday. The notes on testing methods and the suggested developments in testing and operating techniques described in the paper were derived mainly from work performed at the Airborne Forces Experimental Establishment, of which organization the author is a member.

ELECTRICAL DESIGNER'S APPOINTMENT

MR. Frank Brookesmith, until recently electrical designer at Airspeed, Christchurch, has joined Harley Landing Lamps, of Paxton Hill, St. Neots, Huntingdon, where he will assist Mr. Maldon C. Harley. Mr. Brookesmith has been responsible for the electrical installation in the Ambassador, on which the design work is now largely finalized. His services, state Airspeeds, will be available in a consultative capacity.

The Double Mamba flying in the Fairey 17



TWIN ENGINE PERFORMANCE

FROM A SINGLE INSTALLATION

The Double Mamba power unit—first of its kind in the world to fly—gives all the advantages of twin engine performance with a reduction in weight and the frontal area of a single installation. As it is possible to shut down and restart either engine independently, it provides the Fairey 17 anti-submarine aircraft with increased flight endurance and a high reserve of power.

DOUBLE MAMBA

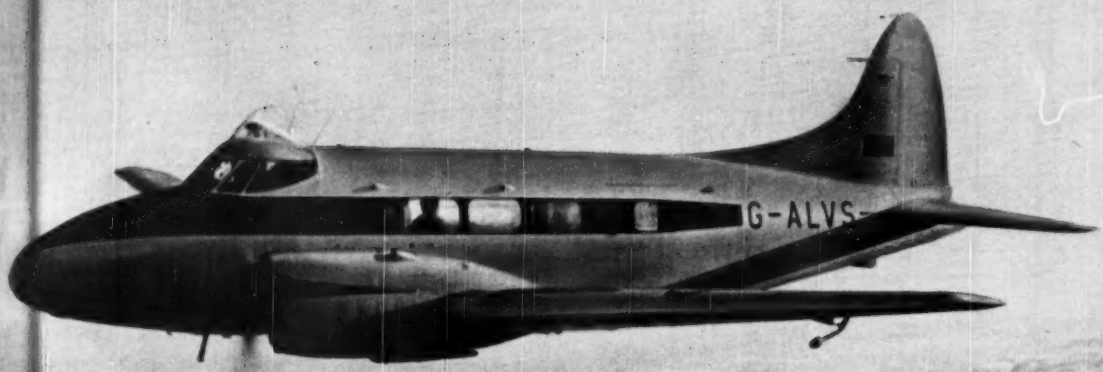
PROPELLER TURBINE

ARMSTRONG SIDDELEY MOTORS LTD

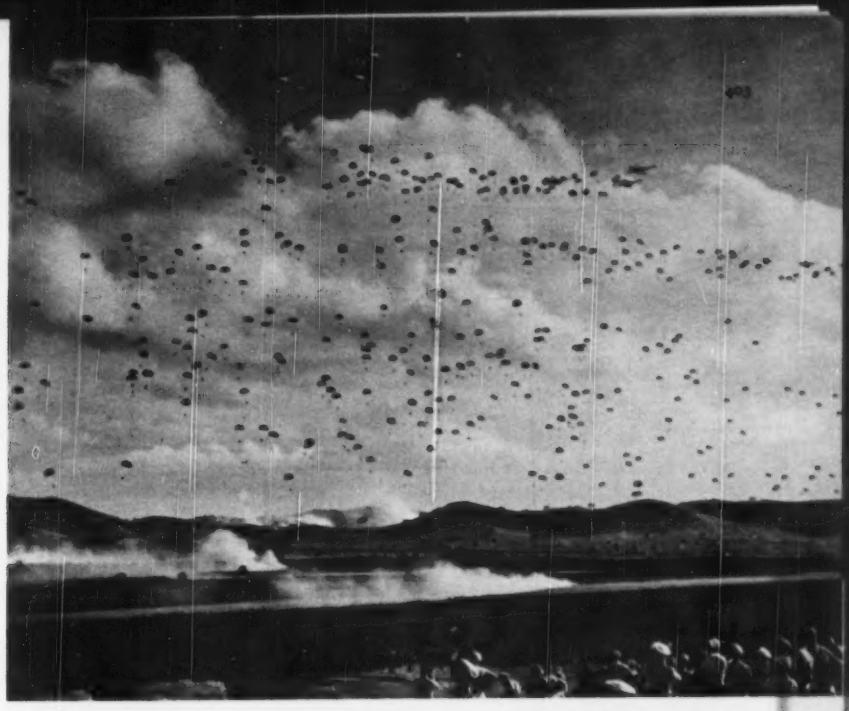
PARKSIDE COVENTRY

MEMBERS OF THE HAWKER SIDDELEY GROUP

A Dove for the British Embassy in Washington— one of the many executive models in private, industrial and diplomatic service in eighteen countries

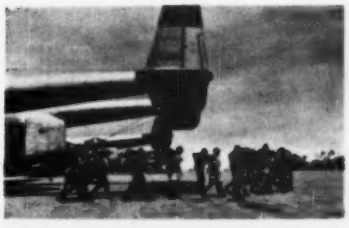


DE HAVILLAND DOVE



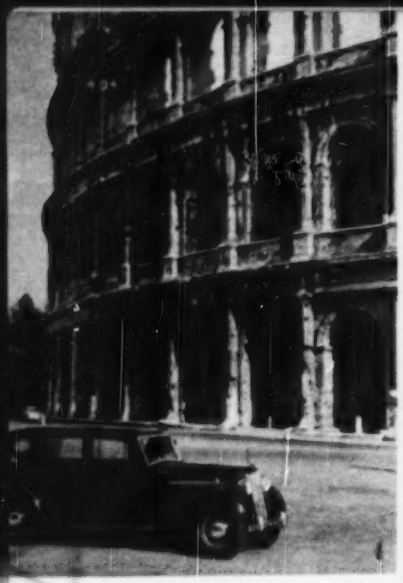
THE BIG DROP

Fairchild C-82 Packets in Large-scale Action on American Inter-Service Manoeuvres



THE main contribution of the 314th Troop Carrier Wing, U.S.A.F., to joint Army-Navy-Air Force manœuvres recently concluded in the Puerto Rico area was a mass drop of a thousand paratroopers from Fairchild C-82 Packets over a small airstrip on the island of Vieques. Some hundreds are seen—against the most obliging cloud backcloth—in the uppermost view. The small photograph, in which the boom tails of Packets are prominent, depicts troopers of the 82nd Airborne Division preparing for action, while below are thirty-odd Packets.

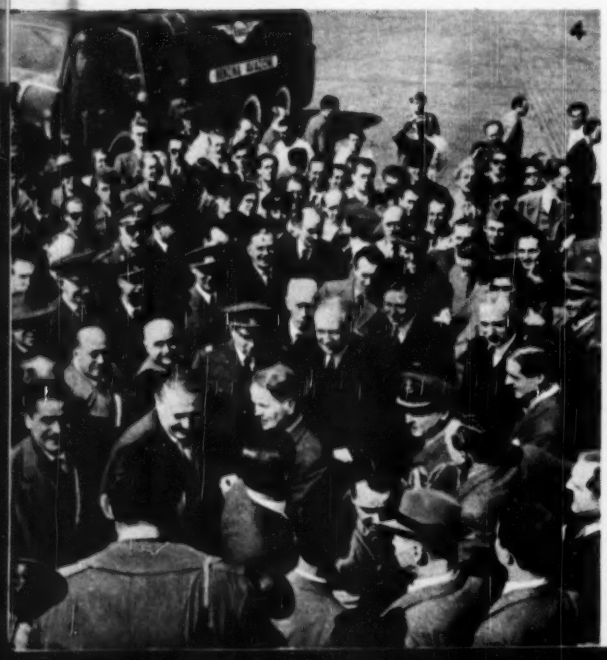
Although no aircraft comparable with the Packet in convenience of loading and discharging is in R.A.F. service, the Blackburn and General Aircraft Universal Freighter, described in last week's issue of *Flight*, represents a major advance in this respect.

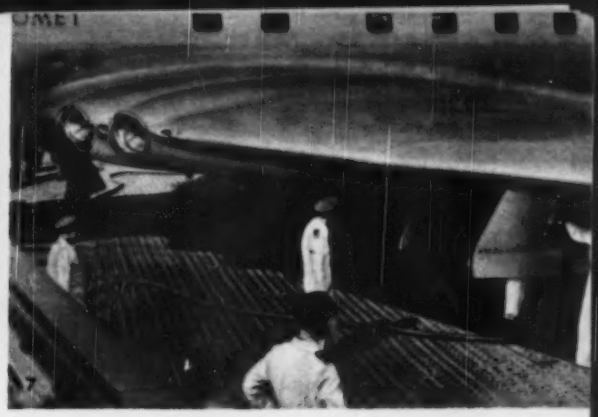


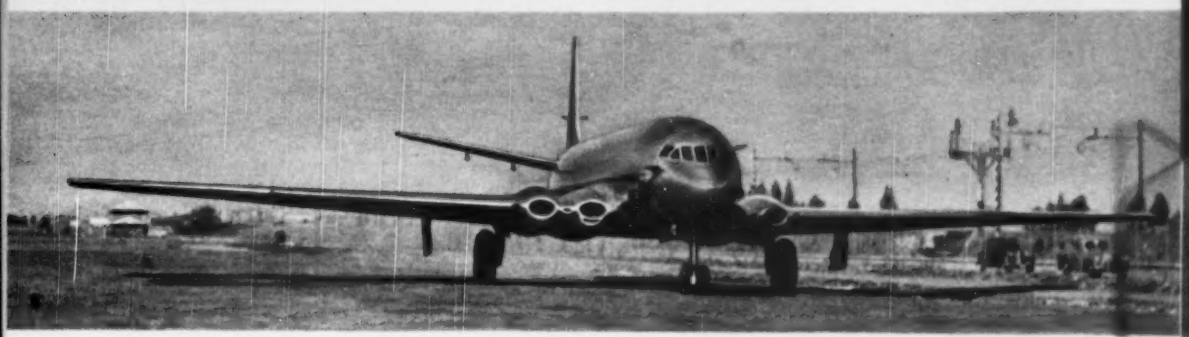
THE COMET IN ROME

Pictorial Postscript to Last Week's Story of a Record Flight

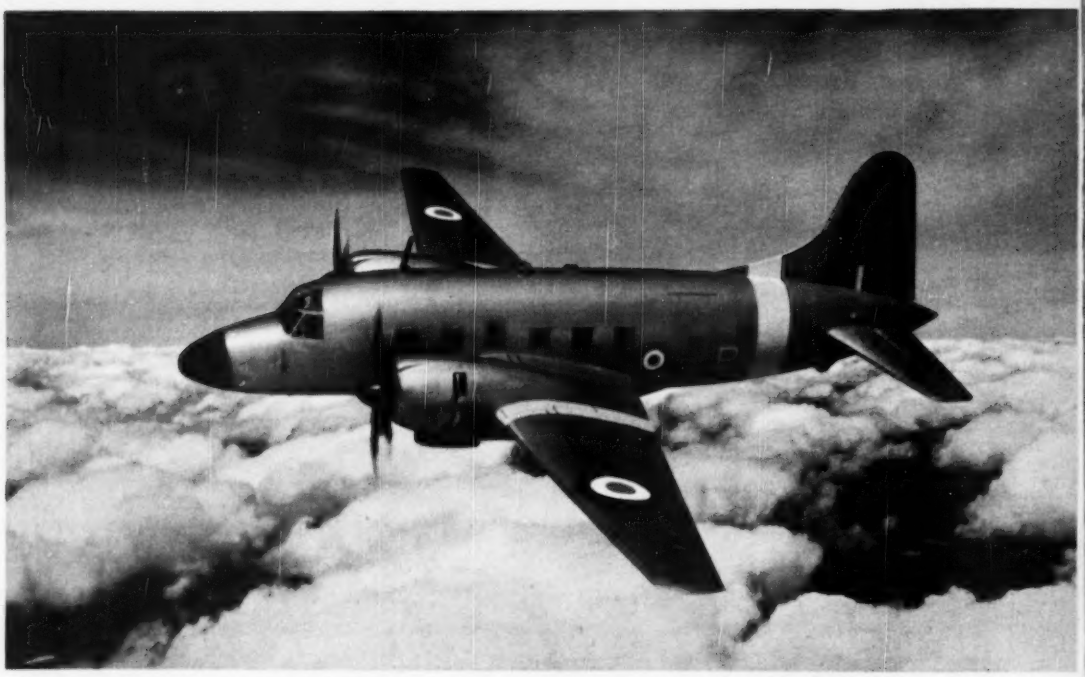
THE enthusiasm which greeted the de Havilland Comet's arrival in Rome after its record flight from Hatfield on March 16th—scenes which were repeated in Copenhagen five days later—is admirably conveyed in several of these photographs. (1) A British staff car awaiting the return of the guests from an inspection of the Coliseum. (2) Completing refuelling at Ciampino, Rome's airport. (3) Rome and the River Tiber fall away as the Comet climbs towards the Alps. (4) Grouped around John Cunningham are (anti-clockwise): G/C. Adnams (British air attaché), Major J. B. Mullock, Air Marshal Sir Alec Coryton, Mr. F. C. Musgrave, Sir Victor Mallet (British ambassador), Gen. S.A. Aldo Urbani (secretary-general, Ministry of Air Defence), Sen. E. Malintoppi (under-secretary, Ministry of Defence), Gen. S.A. M. Pinna (director of civil aviation), Col. D. S. Fanali (Italian air attaché), On. R. Pacciardi (minister of defence). Behind General Urbani is Sir Archibald Rowlands and on his right Gen. B.A. M. Napoli (director of supply, Ministry of Defence), Gen. B.A. Enea (Ministry of Air Defence), and Gen. D.A. F. Raffaelli (vice-chief of the Italian air staff). (5) John Cunningham, de Havilland's chief test pilot, with Col. E. Cigerza, foreign liaison, Italian Air Ministry. (6) Luncheon group: Left to right, Signor Valerio di Meo (aviation manager, Esso, Genoa), Mr. Martin Sharp (D.H. public relations manager, toasting the hosts), Dr. A. Croxatto (Esso director, Rome), Signor G. Gerbi (technical manager, Esso, Rome). (7) Close-up of under-wing pressure refuelling in progress. (8) The Comet turns to park on arrival. (9) A study of John







Cunningham and members of his crew while flying at 32,500ft. Ground speed was approximately 550 m.p.h. (10) Reception in the attractive airfield restaurant. In the foreground Major Daniela, foreign liaison, Italian Air Ministry, is talking to Mr. F. E. N. St. Barbe, de Havilland director. Between them is Sir Archibald Rowlands, permanent secretary to the M.o.S. Beyond G/C. Adnams (back to camera), who is in discussion with Mr. Hugh Buckingham, de Havilland director, can be seen Air Marshal Sir Alec Coryton, Controller of Supplies (Air), M.o.S. (11) Inspecting and sampling the Comet's temporary furnishings are (left to right) Sir Victor Mallet Sen. Malintoppi, Gen. B.A. Enea, On. R. Pacciardi, Gen. D.A. F. Raffaelli, Mr. Hugh Buckingham and Gen. B.A. M. Napoli. (12) So large and enthusiastic was the crowd which greeted the Comet in Rome that the passengers had some difficulty in alighting. On the steps is the Editor of *Flight*, followed by Maj. Oliver Stewart and Mr. Frank Lloyd (D.H. commercial sales manager). An account of the journey appeared last week.



With the underslung bombing compartment obscured by the wing, and the nosewheel undercarriage retracted, the Vickers-Armstrongs Varsity in this view differs little from the Valetta, except in nacelle and nose design. The windows are seen to be of generous area.

"Flight" photograph.

AIRCREW TRAINER

Layout and Equipment of the Vickers-Armstrongs Varsity T.Mk.1, Ordered in Quantity for the Royal Air Force

A COMPANION type to the Valetta transport, already in production for the R.A.F., the Vickers-Armstrongs Varsity aircrew trainer is similarly hallmarked in having been adopted for Service use. Though the two machines have much in common, and benefit jointly from civil and military experience with the Viking, of which both are linear descendants, the Varsity embodies substantial structural alterations, mainly arising from the new (nosewheel) undercarriage. As for flying qualities, it is only necessary to instance the spirited performance of the first prototype Varsity at last year's S.B.A.C. display.

It will be evident from the following description and sectional drawing that the Varsity is an aircraft of exceptional versatility, and that its potential field of application extends far beyond the officially prescribed duties of the R.A.F. T.Mk.1 variant, with which this study is concerned. Briefly, the Varsity T.Mk.1 is intended for instruction in air navigation and bomb aiming, pilot training and signals training by day or night. It is interesting to observe that R.A.F. requirements do not include facilities for gunnery instruction.

The cantilever, stressed-skin wing has a single built-up spar, at 30 per cent chord, and chordwise formers. A point which is, perhaps, not generally appreciated is that the span is slightly greater than the Valetta's, being 95ft 6in against 89ft 5in. The hydraulically operated flaps (of conventional split-type) are of rather larger chord than is usual and are correspondingly of greater area (101 sq ft total); they have increased angular movement (47 deg to 70 deg), and extend from the wing roots outboard to the Frise ailerons. Some modification to the basic Frise form

of aileron is to be found in the use of Westland-Irving nose balances.

Built up on transverse frames and longitudinal stringers, the oval-section fuselage affords virtually uninterrupted cabin space from the cockpit to the toilet compartment at the rearmost end—a consideration of some importance in a "class-room" crew trainer. Though the main spar passes through the cabin, there is, nevertheless, ample headroom above.

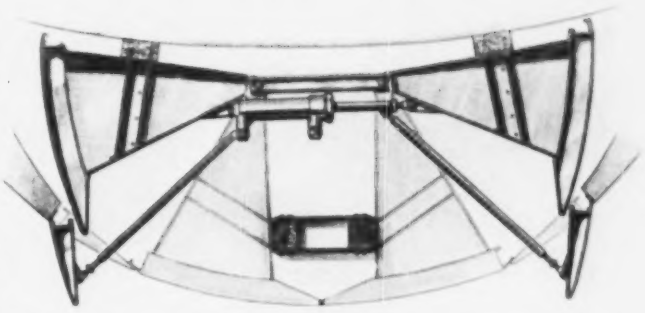
The undercarriage comprises two main units, retracting into the nacelles, and a steerable, retractable nose-wheel unit. All units have twin wheels and single oleo-pneumatic shock-absorber legs and retract forward, under the action of single hydraulic jacks. As with almost all Vickers aircraft, the Varsity's undercarriage and hydraulic components are of Vickers design and manufacture. However, Dunlop disc-type hydraulically actuated wheel brakes are used, the system being duplicated.

The steerable nosewheel will come as something of a novelty to the Service. In this unit the wheels are steerable by the pilot but are capable of free castering when the aircraft is steered by use of the differential brakes. To permit steering to greater angles, when being towed by tractor, provision is made for disconnection of the steering torsion links. A helix inside the oleo ensures automatic self-centring for retraction when the ground loading is removed from the wheels.

Production aircraft will be powered by Bristol Hercules 264 fourteen-cylinder, two-row, sleeve-valve radials, with two-speed superchargers and operating on 100-octane fuel. This mark of Hercules is similar to the 265 installed in the first and second prototypes, except that no torquemeter is fitted. The airscrews are of the Rotol R82/456/8 constant-speed, fully feathering type, 14ft in diameter and having a pitch range of 70 deg.

Ratings for the Hercules 264 and 265 are as follows:—

	Supercharger ratio	b.h.p.	r.p.m.	Boost (lb/sq in)	Altitude (ft)
Take-off (5-min limit)	"M"	1,950	2,800	13.0	S.L.
Combat flight (5-min limit)	"M"	2,000	2,800	13.0	3,250
Normal climb and cruising	"M"	1,610	2,400	9.0	3,250
Continuous (rich)	"S"	1,540	2,400	9.0	12,250
Cruising continuous (Lean mixture)	"M"	1,130	2,400	2.5	12,500
	"S"	1,080	2,400	2.5	21,000



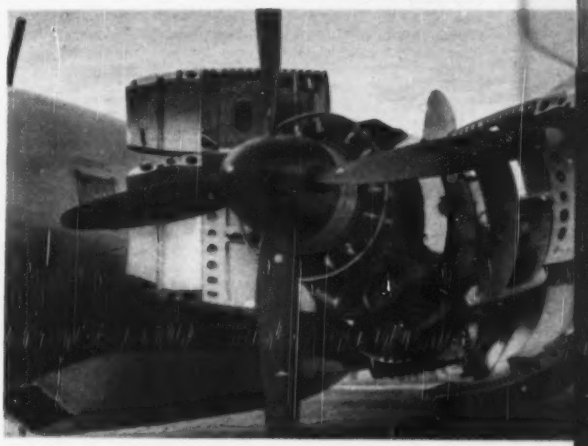
Showing action of the hydraulically-operated bomb-bay doors. The left-hand of the two views below discloses that ground clearance was an important consideration.

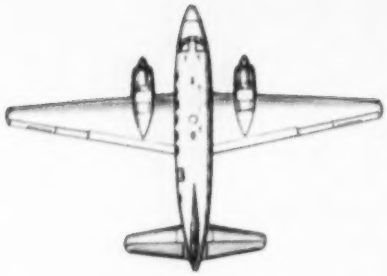
Each engine is built into a power plant, attached to the nacelle by a triangulated tubular structure secured through the firewall, and, for ease of maintenance, enclosed by an ingenious four-piece "petal" cowling. This cowling is constructed in two main sections—port and starboard—each of which is hinged vertically at the firewall. Hinged longitudinally along the upper edge of the starboard panel is a top panel, and a bottom panel is similarly mounted on the port main panel. All panels are formed with an inner and outer skin, having an air space between. In the closed position the cowling rests on its front end on a tubular ring, supported by V-struts from brackets on the engine casing and by stays to the cylinder heads. When closed, the panels are locked together along each pair of edges by two Napier fasteners and one Vickers fastener.

Built into each side panel are two large cowling-gills, operated through rods and levers by an electric actuator. Exhaust gases from the front and rear cylinder ports are discharged through individual pipes connecting with an exhaust manifold system behind the rear bank. From the outboard section of this manifold there is a short outlet pipe which passes the gases to atmosphere clear of the mainplane. A heater muff is incorporated in the lower section of the manifold, from which pipes convey warm air to the aircraft heating system.

Each engine drives a Rotol accessory gear box, mounted on the rear face of the firewall and carrying a Lockheed

Comparative views of one of the Varsity's petal cowlings, much admired at the last S.B.A.C. Display. The whole engine installation is a notable advance on Valetta and Viking practice, and should prove a boon to ground-crew when the new trainer is issued to the squadrons. *"Flight" photographs*





AIRCREW TRAINER . . .

hydraulic pump for the general hydraulic services, Hymatic compressor for the pneumatic system, Pesco pump for the vacuum system, 6,000-watt generator for electrical and radio supplies, and a tachometer generator.

The hydraulic system serves the undercarriage units, nosewheel steering, flaps, bomb doors and wheel brakes, and is supplied by the Lockheed pumps and cut-out valves, working at a nominal pressure of 2,000 lb/sq in. There is a hand pump which, through the operation of a selector valve, can be made to lower the undercarriage in the event of failure of the main system or to supply power to ground-test the various services. The hot-and-cold-air shutters and air cleaners are operated pneumatically, the air bottles being charged by the Hymatic compressor.

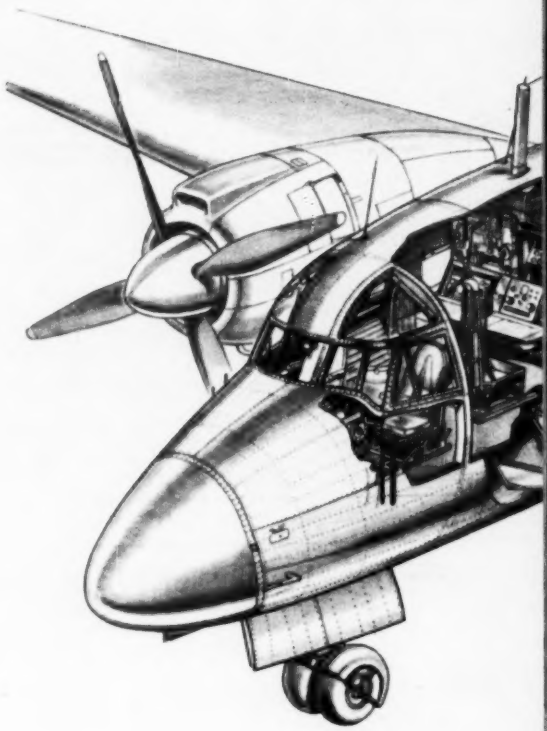
There are four Marston Excelsior crashproof fuel tanks in the outer wings, two forward and two aft of the spar, and provision is made for two overload tanks in the inner wings. Booster pumps deliver fuel to a collector box in each nacelle, whence it is fed to the engine-driven pump supplying the engine. There are separate oil systems for each engine, for which a tank is mounted behind the fire-wall in each nacelle.

Each power plant has a Graviner fire-extinguishing system, including three spray rings disposed about the engine. The rings are supplied by three bottles containing methyl-bromide, housed aft of the bulkhead, and there is a fourth bottle to supply the injector unit direct. Flame-switches ensure that, if a fire or excessive heating should occur, a warning lamp on the pilot's instrument panel is illuminated. After the pilot has feathered the airscrew of the faulty engine, the bottle serving the injector unit is automatically fired, and, following a short delay, the remaining bottles are also brought into play, irrespective of whether or not the fire has been doused. There are two other methods of operating the system—by depressing a button on the instrument panel, and by the operation of two inertia switches which are automatically tripped should the aircraft make a crash-landing.

The main de-icing system supplies fluid to the airscrews and airframe. From a 52-gallon tank, located behind the oil tank in the starboard engine nacelle, T.K.S. pumps—each driven by an electric motor—supply fluid to the airscrew hubs, whence it is distributed by centrifugal force. Fluid for the mainplanes, tailplane, fin and rudder is pumped to distributor elements of porous metal, and is dispersed over the leading edge of each component by the action of the slipstream. The twin pumps are controlled by the pilot and only under very heavy icing conditions are both operated simultaneously. Windscreen de-icing is effected by a Dunlop Mk III pump, which draws fluid from a 2½-gallon tank on the port side of the fuselage and delivers it through piping and two sprayers which cover the area swept by the two wiper blades. On the port side of the cockpit is a Ki-gass pump for supplying fluid to the windscreen in emergency.

In service, the Varsity will normally be flown with a flight crew of three—first pilot, second pilot/navigator and wireless operator. There are six trainee stations. Side by side in the nose are the first and second pilots (or pilot-instructor and trainee), with a pedestal between them and complete dual-flying controls. Being mounted on longitudinal shafts running through the dashboard, the control columns do not interfere with leg movement. Push-pull rods and levers are used for all the main flying controls, but the trim-tab controls, mounted on the pedestal, are connected to their jacks by chains and cables. A Mk 9 automatic pilot is specified.

Close behind the cockpit is the wireless operator's station, with side-by-side rearward-facing seats and the following



That the roominess of the Varsity's oval-section fuselage has be in equipping it for crew training is evident in this special *Flig* the extreme nose of the fuselage, but not shown, is a 3-ft radar equipment includes H2S, Rebecca and radio compass.

put to good account
rawing. Housed in
nner. Instructional

equipment: general-purpose transmitter-receiver, V.H.F. transmitter-receiver, tunable beam-approach, I.F.F. and intercomm. The pilots have 25g harness, and the seats for the W/T. operators are of a special high-backed type to support the head and back against abnormal accelerations.

Between the flight crew's quarters and the main spar is the bomb-aiming station, with provision for instructor and pupil. This is in the form of a large underslung cell—often termed a "pannier"—provided with a mattress on which the pupil lies prone. Access is gained through two hinged flaps in the main flooring, below which there are

VICKERS-ARMSTRONGS VARSITY T.Mk. 1

Two 2,000 h.p. Bristol Hercules 264 sleeve-valve engines

Dimensions

Span	95ft 6in
Length	67ft 6in
Height	23ft 11in
Gross wing area	973 sq ft

Weights

Tare weight	27,040 lb
Basic operationally equipped weight	30,820 lb
Max. take-off weight	37,500 lb
Max. landing weight	36,000 lb

Loadings

Wing loading	38.5 lb/sq ft
Power loading	9.61 lb/h.p.

Performance figures have not been made available.

It is difficult to imagine a more revealing aspect of the Varsity than that presented here, showing it with "everything down."

AIRCREW TRAINER . . .

two steps. In the centre portion of the cell, normally enclosed by sliding doors, is stowage for twenty-four 25-lb practice bombs, in four rows of six. The cell proper is faired off at the rear.

Aft of the spar is a combined station for two navigator-pupils, with a separate crash-position seat for an instructor. A fixed bench-type seat between the pupils' seats enables the pupils to position themselves opposite any of the instruments, and allows room for the instructor to sit between them. All seats are designed to withstand a 25*g* acceleration. A stowage rack is fitted to carry all the remote equipment necessary for the operation of H2S, Rebecca, radio compass, A.P.I., G.P.I. and intercomm.

In the roof over the navigator-instructor's crash-position seat—which is made adjustable in height for use as a platform—is an astrodome. A 3-ft radar scanner is fitted in the extreme nose, and at the rear end of the cabin, under the floor is provision for a camera and a flare chute, the top of the latter being above the floor to permit ready reloading. Convenient to the chute is stowage for six flares and twenty-seven flame floats. Access to the camera and to the resetting handle of the flare chute is afforded by hinged traps.

Special attention has been paid to the provision of emergency exits. Parachute escapes can be effected either through an inward-hinging door at the pilot's position, or through the port-side door, which is likewise hinged to open inwards. The cabin windows, moreover, are designed as pull-in escape apertures for use in a crash-landing or ditching, and, for the same reasons, the astrodome is made removable. Just forward of the spar are two extra-large windows.

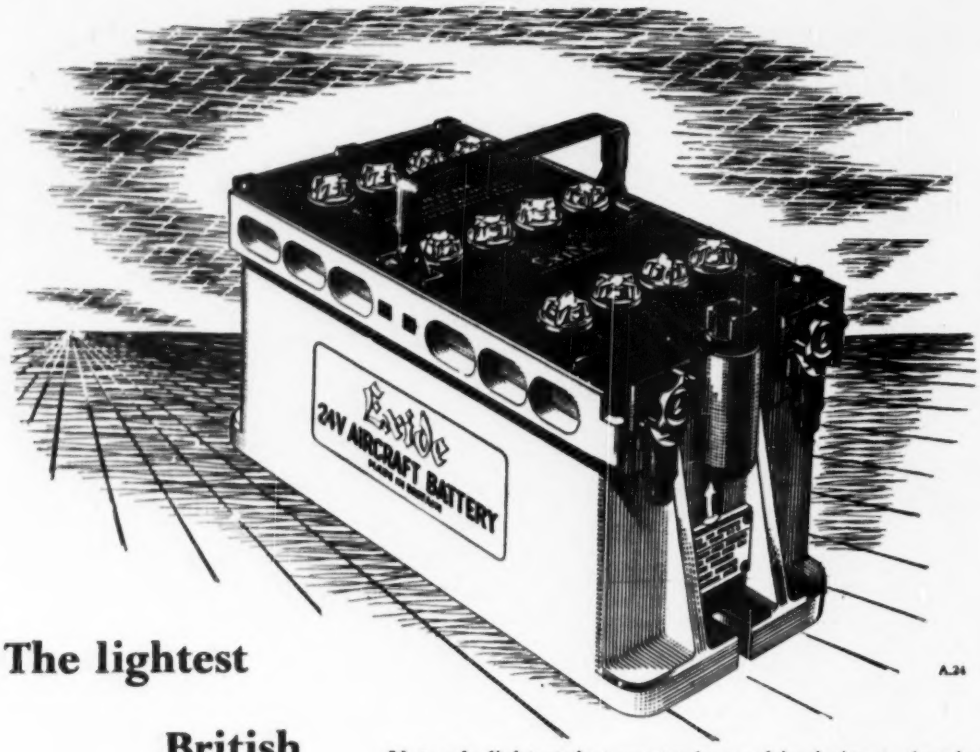
The walls of the cockpit and cabin are lagged for sound absorption and heat insulation, and the cockpit can be screened from the cabin by a curtain. Air-conditioning and ventilation systems ensure that the trainees shall not be distracted from their studies by physical discomfort. Cold and exhaust-heated air are fed into a mixing chamber, from which the fuselage is supplied through ducts and grilles running along the cabin walls, and vitiated air is extracted by aerodynamic suction through a central roof-duct leading to external louvres at the rear of the fuselage.

The main oxygen system is sufficient for a complement of eleven men for 5½ hr at 30,000ft. There are six cylinders, each of 2,250 litres capacity, and points are suitably distributed for the crew and trainees. Additionally, there are four portable oxygen sets.

It is thus clear that, in the Varsity, the R.A.F. will have a crew trainer of great versatility, thoroughly modern in concept, and altogether well suited to replace the converted Wellingtons which, for the present, continue to perform so well in a similar role. Upon Varsity crews will largely devolve the responsibility for instructing pilots, navigators and bomb-aimers for Britain's jet-propelled bombers, the first of which should be operational next year.

Riding high and handsome over Southern England on a makers' test flight is "VX828," the first prototype of the Varsity T.Mk.1.

WESTERN AVENUE, PARK ROYAL, LONDON, W.3



A.24

The lightest British civil aircraft battery of its voltage and capacity

Not only lightest, but most advanced in design & electrical performance. One-piece container of tough, acid-proof, shock-resistant plastic. Quick-release fully-polarised terminals. Simple two-point fixing. Easy control of electrolyte level. Ribbed microporous P.V.C. separators. Long-life plates. High output for engine starting.

Exide AIRCRAFT BATTERY

24 V. 15 Ah. 32½ lb. — 24 V. 25 Ah. 43½ lb.

A PRODUCT OF CHLORIDE BATTERIES LIMITED · EXIDE WORKS · CLIFTON JUNCTION · NEAR MANCHESTER

AMERICAN NOTEBOOK

By

Stanley H. Evans,
M.R.Ae.S., A.F.I.Ae.S.

HUNTING, FISHING . . .

As readers who saw the photograph and brief description in *Flight* of March 9th will remember, Lockheed have brought forth a new and specially equipped version of their P2V Neptune patrol bomber for hunting and destroying schnorkel-aspirated submarines. Designated the P2V-4, it combines a very long range with newly developed magnetic detection gear and radio sonobuoys for pinpointing the submarine target, plus a heavy offensive armoury for making the kill. To permit efficient operation of this new electronic search apparatus, a large streamlined radome is located underneath the fuselage just forward of the wing root, and smaller radomes are fitted to the wing tips. Navigation and communication equipment, and specialized all-weather gear, are designed for operating in any part of the world, particularly in such stormy areas as the North Atlantic and the waters around Alaska.

Offensive weapons that can be carried include torpedoes, rockets, bombs, mines, 20-mm cannon and machine-guns, while some idea of the range performance can be gleaned from a recent non-stop flight of a fleet P2V which took off from a carrier and covered a distance of 5,156 miles in just under 26 hours, averaging 198 m.p.h. Another P2V, the famous *Truculent Turtle*, still holds the world distance record (without refuelling) of 11,236 statute miles made some three years ago, but such a figure points up a special case and is not claimed as the normal operating range.

Claimed for the P2V-4 is the ability to make radar contact with an enemy submarine, running either on the surface or with just the schnorkel-tube breathing above the water, while the use of the magnetic detection apparatus permits pinpoint location even when the sub. is completely submerged. In the latter case, radio sonobuoys, carried internally in the aircraft, are dropped in the area where the boat has been detected. A microphone and small radio set on the buoy pick up and relay the sound-waves of the sub.'s propellers back to the aircraft from which an accurate position is then determined for driving home the attack.

In normal operations, such as convoy duty, the P2V-4 would operate in conjunction with surface vessels, ranging well ahead on search patrol. Should a submarine pack be located, the aircraft would promptly radio a contact message to the convoy and proceed to launch an independent attack while the surface craft were racing up to join the kill. At the least, the P2V would keep the pack completely submerged and running on their batteries at a greatly reduced under-water speed, until the surface destroyers, with their more sensitive search gear, could arrive on the scene. This technique makes that of the submarine more vulnerable, since it prevents the sub. from approaching its target or speeding out of the contact area.

Ski-feet up : The P2V with its Arctic landing-gear retracted

The Neptune family line has been in continuous production at Lockheed since it was started in 1945 and to date more than 150 of the earlier P2V-1, -2 and -3 models have been turned out and are in active naval service from Newfoundland and Alaska to the Panama Canal. Manufacturing economies, therefore, will result from this earlier production experience, although, somewhat contrary to what might have been expected from the superficial resemblance of the P2V-4 to the rest of the family line, about 60 per cent of the tooling requirements will be new. One possible reason for this, *inter alia*, is that the powerplant of the P2V-4 is the new Wright R-3350-30W compound engine rated at 3,250 h.p., in place of the 2,500 h.p. of the R-3350-24W engine powering the P2V-2. This new installation would account for the reported increase of range from 5,000 to 6,000 miles.

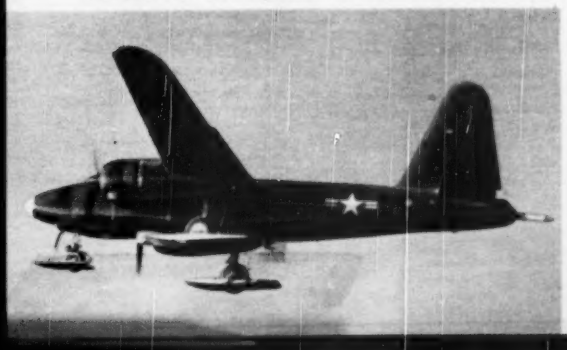
. . . AND SKI-ING

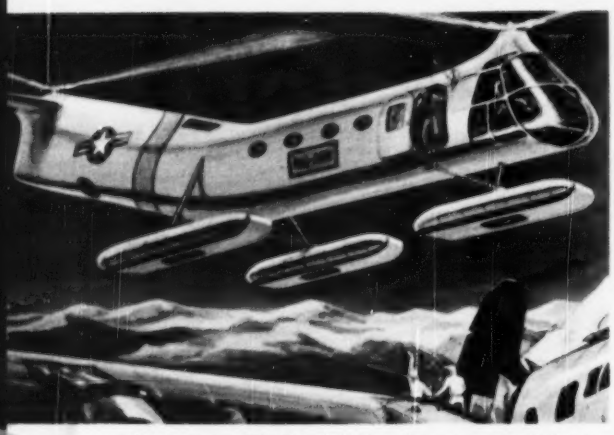
An interesting new trend in landing-gear design has appeared on the American scene in the shape of a retractable wheel-ski combination which permits landings and take-offs on bare runways or snow and ice. Such amphipodal combinations are now being designed for aircraft as big as the Douglas C-47, Fairchild C-82, Northrop C-125, and the Lockheed P2V Neptune. The accompanying illustrations show how neatly the job has been done on the last-named aircraft, which has been seen sky-ing with its snowshoes on, if not actually ski-ing, in the Los Angeles locale for the past two or three months.

Designed for Arctic operations, the combination wheel-ski gear is tucked up in flight inside a fairing underneath the engine nacelles and the fuselage nose. For landings on standard runways, the three wheels of the normal tricycle landing gear protrude through openings in the skis, while for snow operation the skis are lowered farther. Made of aluminium, the three ski elements provide a total ground contact area of 160 sq ft, of which the main skis contribute 64 sq ft each and the nose 32 sq ft. Length of the main skis is 16ft, which is claimed to make them the largest yet fitted to an aircraft flying on the occidental side of the Bering Strait.

This ski version of the P2V is fully equipped for cold-weather operation with super-sized heaters, sun-compass,

Ski-feet down : For normal runways the wheels project through the skis : for snow operation the skis are lowered farther.





Arctic rescuer: The Piasecki H-21 tandem-twin-rotored helicopter is the winner of a U.S.A.F. competition. The landing gear combines built-in skis and inflatable pontoons for alighting on land, snow, ice or water. Power-plant is a Wright R-1820-76A Cyclone.

AMERICAN NOTEBOOK . . .

special radio and radar for use near the magnetic poles, and additional fuel tanks for extra-long-range operation. Of particular importance for military use are the winter rescue gear and the special camera installations in the fuselage for mapping of Arctic areas. A look at the global map will show why this part of the international boundary fence is probably the most vulnerable spot in the U.S. defence perimeter. Seattle, Washington, the nearest U.S. city, is only some 2,250 air miles away from Russian air bases on the Chukotski Peninsula opposite Alaska. It seems a fair guess, therefore, that on both sides of the Frozen Curtain the aerial photographers are more concerned with map-making than hunting, fishing and ski-ing. The shooting season (we hope) will be indefinitely delayed.

VERSATILE LIFEBOAT

"The time has come," the North Wind said,
"to talk of many things—
Of rescue ships with padded feet, of lift with
rotary wings."

Selected in a design contest among four manufacturers, the Piasecki H-21 has been announced as the winner of the U.S. Air Force's $12.5 million competition for an Arctic rescue helicopter. The losing three designs were the Sikorsky YH-19 (illustrated in *Flight*, December 15th, 1949), the Bell YH-12B, and the twin-engined McDonnell XHJD-1, built for the U.S. Navy. The winning design is a heavier and more powerful development of the Navy-Piasecki HRP-1 Rescuer and follows the same general configuration, with tandem-twin-rotors mounted at the ends of an elongated, bent-up-banana-shaped fuselage. In the H-21 the 44ft rotors are driven by a Wright Cyclone R-1820-76A engine developing 1,020 h.p. for take-off.

A look at the accompanying illustration of this Arctic omnibian omnibus shows that the most novel feature is the all-purpose landing gear designed for alighting on water, snow, ice or land. To accomplish this the three wheels of the nose-type tricycle gear are surrounded by built-in skis equipped with inflatable nylon-bag pontoons, thus enabling the H-21 to land on any kind of flat surface. Apparently about the only thing this ingenious gear doesn't do is to hide itself away in flight—which, perhaps, would be stretching the ingenuity of its designers a bit too far!

In comparison with its forerunner (the HRP-1), the aerodynamic design of the H-21 fuselage is much cleaner, as well as being more shipshape structually. Thus the rear rotor housing is now integrally faired with the fuselage dorsal into a long vertical fin surface, in place of the clumsy-looking end-plate fins which were subsequently added to the horizontal stabilizer of the HRP-1. The structural cleaning-up has been achieved by substituting the former fabric-covered construction for an all-metal one. The tandem arrangement with the rotors at the extremities of the fuselage permits a structural backbone housing the pilots' compartment, passenger cabin and power plant; it also presents a minimum of fuselage drag and improves the balance by allowing an exceptional range of C.G. travel. Furthermore, the counter-rotating rotors both contribute to the overall lift and eliminate the necessity for an anti-torque windmill at the stern.

The fuselage structure is 54ft long overall, of which the passenger cabin contributes a length of 20ft and a cross-section 5ft 6in. square. Normally, this cabin seats 10 persons, with litter space for 12, but as a troop-carrier it can transport 27 by seating them on the floor. The control cockpit in the nose is provided with side-by-side pilot seating, complete dual controls, central instrument grouping and large transparent look-out panels forward and on both sides. A hinged hydraulic power hoist, operated by the co-pilot, is fitted at the right side of the cabin door for bringing survivors aboard when operating conditions preclude landing. A rear cargo door is fitted on the left side of the fuselage.

No performance data regarding the H-21 military model have been released, but U.S.A.F. specifications for an Arctic rescue helicopter are known to call for a machine that will fly 250 miles, hover for 30 minutes over the rescue area, and make a return 250 miles to base. The following figures have also been published for a proposed commercial version, with a shorter range performance, powered with the Wright 800 h.p. R-1300, and, presumably, with a normal-type landing gear: Gross weight 11,500 lb; weight empty, 7,000 lb; maximum speed 135 m.p.h.; cruising speed, 104 m.p.h.; maximum rate of climb, 1,600 ft/min.

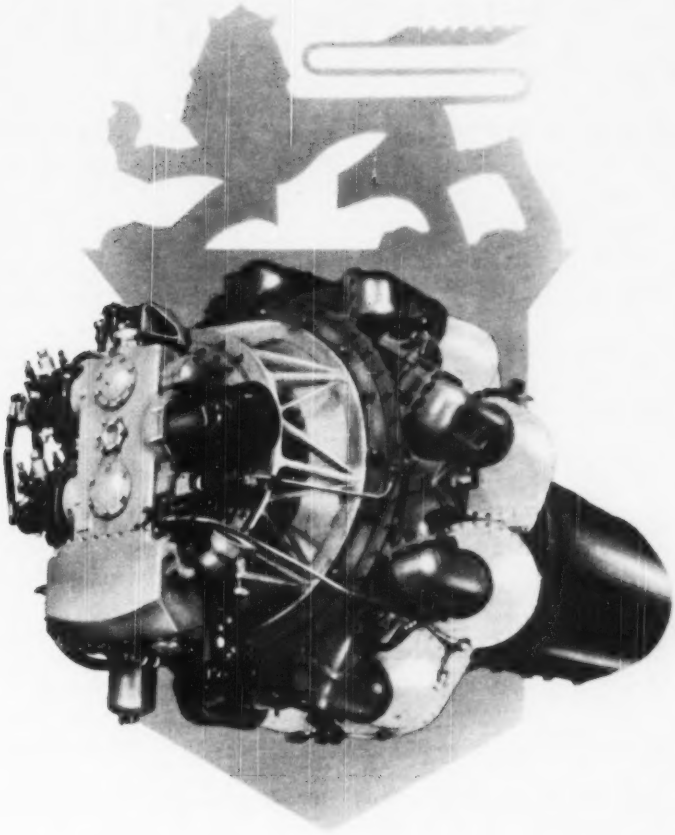
TURBOPROPAGATION

American interest in the turboprop has noticeably increased since the big financial empire of General Motors Corporation moved into the picture a few weeks ago in collaboration with Convair. As noted and illustrated on page 185 of the February 9th issue, Convair are converting one of their Convair-liners from piston engines to turboprops, using a pair of Allison 2,750 s.h.p. XT-38 units. (The latter engine, along with its duplex derivative, the 5,500 s.h.p. XT-40, was described and illustrated in the January 19th issue.) The Allison engine and Aeroproducts propeller divisions of General Motors have joined forces with Convair in financing a joint turbopropped cargo version of the Convair-liner.

Convair expect to have the conversion project flying by June and then delivered to Allison at Indianapolis for the test programme—after which it will be demonstrated to other manufacturers, the airlines and the military services. Seeing that both Allison and Aeroproducts are in the business of selling engines and airscrews to the airframe industry, part of the deal calls for making the conversion engineering and test data freely available to the rest of the industry. Thus, Convair will contribute the power-plant engineering (and be first in the field), while General Motors will purchase the airframe from Convair and supply the engines and airscrews. The bill, incidentally, is reported to run around $1.5 million—obviously a picayune sum for G.M., especially when considered in relation to its stimulating effect on American air-transport design and production.

Now that the starting gate has been thrown open, several other transport manufacturers have hurried down off the turbine fence and are beating for the turboprop side of the pasture. (The pasture, in fact, was a barren wasteland until Allison cultivated it beyond the "squatters' rights" stage.) Boeing have just announced that the substitution of four Allison XT-40A turboprops in place of the present Pratt and Whitney 3,500 h.p. R-4360 Wasp Majors is under study for both the Stratocruiser and the

Progress



Rolls-Royce jet engines are licensed for manufacture in the U.S.A., France and Australia.

ROLLS-ROYCE
Aero
ENGINES

ROLLS-ROYCE LIMITED · DERBY

British Airmanship

SOMETHING TO BE PROUD OF

The past 30 years have seen not only the development of British airlines from the first London-Paris service to a vast network covering nearly 70 countries, but also the steady maturing of something beyond machines and scientific progress. Throughout Britain and the world this has come to be known as British Airmanship and already it has earned a significance comparable with that which traditionally attaches to British Seamanship.

British Airmanship sums up the reputation for skill, enterprise and reliability which in just over a generation of air travel has become inseparably associated with British airmen — something, indeed, to be proud of.

FLY BRITISH

ISSUED BY BRITISH OVERSEAS AIRWAYS CORPORATION AND BRITISH EUROPEAN AIRWAYS

AMERICAN NOTEBOOK : : :

C-97A Stratofreighter. According to Boeing, the conversion job would be relatively simple and it would naturally make possible a greater operating altitude, higher speed and heavier gross weight for the stratospheric family, since these aircraft were originally designed for stratospheric conditions with a basic structure built to withstand a higher degree of cabin pressurization than is now used. In other words, the turboprop installation will enable the Stratocruiser to stratocruise.

Boeing design studies indicate that with four XT-40A turboprops the Stratocruiser or C-97 could carry more passenger or cargo payload; the required field length would be considerably shortened, in spite of the higher gross weight; and some 1,000 U.S. gallons of additional fuel could be carried, since it is estimated that the overall weight of the turboprop installation would be approximately 25 per cent less than that of the present piston engines. Apropos which, a question that comes to mind is just where will the extra fuel be housed? Assuming that it can be stowed internally in the wing, one imagines that the conversion job will be somewhat bigger than optimistically appears at first sight. Perhaps we shall witness a new commercial fashion in external wing-tip tanks for these turboprop conversions.

After ruminating within the deep shadow on the turbojet side of the hedge, Douglas engineering executives are also now reported browsing in the verdant patch which has sprung up on the other side. Whether this means that Douglas have temporarily given up their earlier civil jet studies we do not pretend to know. Somehow, with one eye warily cocked at Lockheed, we hardly think so. But engineers are like politicians in at least one respect—they have a disconcerting habit of climbing on the passing band-wagon and, just now, the trumpets are playing an enchanting fanfare on the turboprop theme.

With the Allison XT-38 and XT-40 about ready to drop their "X" classification and receive C.A.A. endorsement for the civil market, Douglas believe that turbopropped versions of their existing transport types will enable them to cover just about the entire field of air transport requirements for the next decade or so. Thus, the turbopropped DC-6A and 6B airframes would take care of the domestic (medium-range) passenger and cargo market, while the C-74 (Globemaster-I) and C-124A (Globemaster-II) would fulfil similar roles in the trans-oceanic (long-range) class.

Now that Boeing and Douglas look like joining Convair in the turboprop chorus on the Allison band-wagon, it will be enlightening to watch the reaction of Lockheed, hitherto considered the best bet for starting the civil-jet race off the mark in the U.S.A. It is a fair certainty that both the Constellation and the Constitution have been well and constantly turbopropped on paper and so we need not be too surprised should Lockheed decide to keep in chorus with Boeing and Douglas. On the other hand, unless we are very much mistaken, the Lockheed engineering team are still highly jet-conscious and their thinking—if not their design configuration—is very much along de Havilland lines. One potent factor which may throw a discordant note into the turboprop symphony is recent trouble with high-powered auto-feathering airscrews; and, in view of the higher powers and reduction gears now contemplated, this problem could get worse rather than better.

Which is not to imply that the turboprop cannot stand fairly and squarely on its own technical merits when used within its proper boundaries on the speed-altitude chart. Broadly speaking, the boundary fence between prop and jet may be defined as that somewhat nebulous level known as the tropopause, which may lie anywhere between 30,000 and 40,000 ft, depending on the prevailing temperature conditions. Again, looking at the economic and operational facets of the U.S. air transport picture, there is not much doubt but that the turboprop is the next logical step-up from the piston engine—especially where, as is the case in America, there are a number of well-tried airframes in existence which appear readily suitable for the conversion process.

From the British viewpoint it would be comforting—but naïve—to think that our American friends (and keenest competitors) were resigned to leaving the high-speed jet transport field wide open for our peculiar benefit. Before long, the burning question of U.S. national prestige will almost certainly dictate otherwise, especially when considered in relation to acknowledged American jet progress in the military sphere; moreover, both logic and economics will be quickly brushed aside as soon as the restless dynamics of the national character asserts itself on the political front. The political kettle, indeed, is almost on the boil.

Our own personal credo is that although the turboprop will remain with us for, possibly, the next ten years or so, this same period will also mark the opening decade of the jet half of the century along the mercantile "highways" of the world. Having started with high aspiration by hitching our band-wagon to a jet star, it clearly behoves us not to sit back and let the turbopropagandists sprinkle salt on the Comet's tail. Obviously the 10,000-lb turbojet is not far off, so we trust that Britain's bright young designers will be ready with the long-range airframe—a Super Comet, with or without tail.

MAINTAINING A TRADITION

THOUGH it seems a far cry from horsed coaches to airliners, it is nevertheless fitting that one of the ancient livery companies of the City of London—the Worshipful Company of Coachmakers and Coach Harness Makers—should foster the tradition of numbering among its members many who have played a responsible part in the development of transport through the ages. Thus, coming up to the present day, many prominent figures connected with civil and military aviation as well as the automobile movement, will be found taking part in the functions of this historic body.

Last week, when the Coachmakers held their annual dinner at the Grocers' Hall, the following were among those in the industry and the Royal Air Force who accepted invitations: Sir Frederick Handley Page, Air Chief Marshal Sir Ralph Cochrane, Sir James Barnes, W/C. W. T. Barnes, Sir Graham Cunningham, A.V-M. Sir William Cushion, Col. W. C. Devereux, A. Cdre. P. F. Fullard, Sir Arthur Gouge, Mr. A. E. Hagg, Mr. Kenneth Horne, G/C. F. C. V. Laws, Mr. Eric Mensforth, Sir George Nelson, Mr. H. G. Nelson, Capt. G. P. Olley, Mr. F. Rowarth and W/C. R. H. Stocken.

MILES AIRCRAFT SUMMONSES

AT Marylebone Magistrates' Court on March 21st, Mr. Frederick George Miles (former chairman and managing director of Miles Aircraft, Ltd.) and Sir William Malcolm Mount, Bt. (former financial executive of the company) were formally committed for trial at the Old Bailey on April 24th on summonses under the Prevention of Fraud (Investment) Act, 1939. Bail of £500 was renewed in each case.

The charges arose from alleged concealment of facts and misleading statements made in a share prospectus concerning the manufacture of Aerovan, Merchantman and other aircraft.

ARLE COURT CELEBRATES

ON Friday, March 17th, the service engineers of Dowty Equipment, Ltd., held their annual dinner at Arle Court, Cheltenham, and a most convivial evening was thoroughly enjoyed by everyone present.

Mr. George Dowty and Mr. R. H. Bound made light-hearted speeches, Mr. Dowty referring to Ezekiel Ch. I, verse 19, and expressing the hope that it would not cause trouble for his patent engineer. Entertainment was provided by Mr. Sam Costa, Mr. Jack Train, and Mr. Geoffrey Richardson, the last-named being a member of the Dowty drawing-office staff; his work on the stage, however, gave no hint of amateur status. Among those who laughed without stint at the "cracks" of Mr. Costa and the seemingly never-ending stream of Mr. Train's stories, were Mr. R. E. Bishop and Mr. C. G. Long, of de Havillands; Mr. A. E. Russell and Mr. F. H. Pollicutt, of Bristols; Mr. S. D. Davies and Mr. H. Rogerson, of Avros; Mr. P. G. Crabbe, Mr. W. G. Carter and Mr. R. W. Walker, of Glosters; Mr. A. Davenport, of Westlands; Mr. H. R. Watson, of Armstrong Whitworth Aircraft; Mr. R. H. Chaplin and Mr. F. Cross, of Hawkers; and Mr. J. Wright, of Dunlops.

AIR SURVEY

The Application of Modern Techniques to Surveying and Mapping

BRIEFLY referred to in these columns last week, a paper entitled *Air Survey* was read before the Royal Aeronautical Society on March 16th by Dr. C. A. Hart, D.Sc., Ph.D., M.I.C.E., F.R.I.C.S., Professor of Surveying and Photogrammetry in the Department of Engineering, University College, London.

Professor Hart introduced his paper with the statement that, to achieve good results from an air survey, closely integrated teamwork was required. The airman, photographer, instrument specialist, meteorologist and the surveyor were each dependent upon the other, and any weakness in the chain made results more expensive and less effective. Air survey implied neither merely the taking of air photographs nor, solely, the production of maps from them. The definition included all uses of aircraft for mapping, for indirect measurement of long lines on the earth by radar methods, for reconnaissance in undeveloped countries and for geological and geophysical surveys.

Surveyors had to have a rigid framework which was still generally provided by field surveyors, although air survey was increasingly able to reduce the amount of ground work—particularly if radar methods were used—whilst for geodetic surveying, where wide gaps had to be bridged, the new methods of radar ranging were proving invaluable as a means of providing a reasonable accuracy with much greater speed. In triangulation in the past, the triangles were established by angular optical measurements, the sides being generally not more than 100 miles in length, scale being fixed by measured base-lines, and orientation by astronomical observation. Radar methods now enabled sides of 500 miles or so to be measured directly with considerable accuracy.

The application of electronic measurement to surveying had become possible because of the precision of the frequency of radio transmissions and of the accuracy with which the time of transmission of signals might be measured. As an indication of the precision obtainable the D.S.I.R. began experimental standard frequency transmissions from Rugby on February 1st, 1950, monitored by the N.P.L. to within two parts in 10^9. Two methods had so far been used for survey measurements: (a) Radar, which was simply a method of superimposing pulsed signals on radio waves, so that accurate times of transmission of signals were measured, and (b) Phase-difference of continuous-wave radio whereby positions might be fixed by measuring the difference of phase from a pair of stations, if a starting point for calibration was known. The Decca Navigator worked on this principle.

Radar Methods

Radar navigation for controlling photography had proved effective since any part of a block of photographs might be flown accurately at any convenient time by this means. The method mainly used to date had been that of instantaneous range measurement by radar, simultaneously with photography, from the aircraft to two accurately located ground stations, or vice versa. Knowing the location of the stations, the two slant-range measurements, and the approximate altitude, the position of the aircraft might be determined in relation to the earth's surface. Also the ranges for a particular position might be pre-determined, and the aircraft navigated to that position for an exposure. When no suitable maps existed the ground stations might be plotted on a blank graticule and the range for each strip determined, first by selecting an arbitrary starting range, and subsequently, by computing the radar range difference for the required lateral overlap.

An important advantage of radar navigation and fixation of air photographs was that when it was necessary to avoid delays in the preparation of the map, the flying programme might be computed geodetically, and the actual positions would be found to correspond closely enough to allow of simple interpolation for the absolute fix. The Decca Navigator system was proving of value for strip navigation, and tracking was either effected by flying along a lattice or lane direction or by a navigational plotting technique along a straight line. The Ordnance Survey now specified Decca Navigation for certain of the photography which was done for them by the Royal Air Force, for example, photography at 1/2,500 scale with a 20in lens for 1/1,250 Town Re-Survey where the distance between flight lines was only 250 yards, and where small tilts and deviations could result in serious loss of overlap. In a comparison which was made between visual and Decca Navigation, about 2½ times as many photographs were required to cover a given area effectively by visual nagivation as was required with Decca. It might be mentioned here that the Decca Navigator Co. had developed a light-weight Survey Chain, whereby the ground stations were much more easily transportable than before, so that the system could be effectively used in undeveloped countries or other areas where there was no ordinary navigational chain.

When it came to precise large-scale mapping, air survey could often compete with ground methods only in special cases and particularly where access was difficult, or where the time-factor was important; nevertheless, the availability of photographs for continuous inspection and other methods was increasingly making its use a sound proposition. For topographical mapping, no large scheme would ever again be undertaken without use of air photographs; the hey-day of the expert field plane-tabler was over, and most of his duties were now transferred to the office.

Photogrammetric advances were in the direction of improving photographic and mapping accuracy, whilst aiming at maximum economy and reduction of work on the ground. Many thousands of square miles had been mapped since the end of the 1939-45 war, from radar-controlled photographs taken by the R.A.F. It was, however, for medium- and large-scales where photogrammetry was now in process of establishing itself as a result of advances in techniques and improvements of accuracy. In this country air survey was looked upon as a method of surveying to be used when it was desirable, expedient and economical to do so. Without going into detail, it might be said that the use of air survey for both 1/1,250 and 1/2,500 scales had been accepted by the Ordnance Survey, although much of the work had still to be done on the ground.

Radar range measurement of long lines involved flying an aircraft a number of times across the base between two radar stations. The minimum sum of ranges gave the point of transit, and reduction to the arc of distance between stations could be made accurately, even if the aircraft altitude was not known precisely. Ranges measurable directly by radar were several times greater than anything possible by established optical methods. It had, therefore, been necessary to review the methods by which long lines on the spheroid had been computed in the past, since the accuracy of the standard must be established before that of radar ranging could be assessed.

For geodetic measurement the Shoran system had been most frequently used, and extensive experiments had been made. Many of the early difficulties had been overcome, and the method of flying across the base between radar stations had become well established.

The work done so far showed clearly that the whole approach to geodetic surveys in the future had to be modified, due to air survey methods. Here at last was the opportunity for world unification of triangulation nets. After further research it might well be possible to advance the study of the earth to an extent where a satisfactory world figure might be evolved.

THE DISCUSSION

Mr. E. A. Miskin (University College) said that there seemed to have been some retrogression in the use of radar for the surveyor since 1944, although there had been a corresponding increase in the use of radio as a navigational aid. Again, the development of cameras had been left to the Swiss and French and no reference had been made to the modern plate camera which might have been developed in this country.

G/C F. C. V. Laws (the Air Survey Co., Ltd.) said the real quality needed in an aircraft camera was reliability and he would like to see a camera so made that it could be serviced by a mechanic in the field. He also thought a Dakota with Mamba engines would be a useful aircraft for survey work.

Mr. Shepherd (Hunting Aerosurveys) mentioned a flight for the Ordnance Survey where the accuracy of visual navigation had been kept down to within 80ft of the required track.

G/C. E. Fennessy (the Decca Navigator Co.) thought that claims of (air) surveying to inches were complete nonsense and if the surveyor wished to do better than a minimum accuracy of about 10m, means other than radio or radar had to be found. The Decca Flight Plotter, whereby the aircraft's track was recorded during flight, was a very useful tool; the pilot could lay out every strip on the map and then follow it.

Mr. P. G. Mott (Hunting Aerosurveys) stated that it had been shown in several air surveys that as much as 90 per cent of details from air photographs had been correctly applied and, again, 80 per cent of the detail was applied from the air photographs with certainty, and this was in areas specially selected on account of the density of the buildings.

TO FIGHT FLYING-BOAT FIRES

Special-purpose Floats Designed by Vospers

"*Flight*" photograph.

Demonstrating the use of four hoses from the 55ft (R.A.F. 80) craft. Total output can be either 5,400 gal/min of foam or 1,000 gal/min of water at 130 lb sq in. pressure.

AIRFIELD fire-tenders necessarily differ from standard fire-brigade equipment, and, in the same way, it is desirable that a fire-float intended for duty at marine-aircraft bases should be specially designed for the purpose.

Vosper, Ltd., of Portsmouth, have produced two such boats and, under the direction of their chief engineer, Capt. Basil Cronk, D.S.N., R.N. (Ret.), recently gave a convincing demonstration of their capabilities in Portsmouth Harbour, using as a target a derelict L.S.T. Representatives of the Air Ministry, Admiralty, War Office, Harbour Boards, Air Lines and Fire brigades were present.

The two new boats, which have been designed specifically for fighting fires in marine aircraft by day or night, are a great advance on the types they will replace. Each has two foam pourers, or spreaders, one to port and one to starboard, situated about a foot above the waterline. The foam is used to form a floating blanket round a burning craft and thus prevent ignited petrol or oil from spreading over the surface of the water.

Another important feature which is common to both types is that both mast and deck-house roof are collapsible, so enabling the boat to get under the wings and close in to the hull of a flying boat in trouble. Each has floodlights and searchlights for night work, and loud hailers and radio telephones are also fitted. Rescue nets hang over the side for swimmers to grasp and ordinary fire hoses can be used in addition to the universally-mounted monitors on the decks.

An innovation of particular interest is the fitting of below-water reaction jets which enable the coxswain to counteract the thrust created by the monitors when all are operating and by so doing to keep his float within range of the burning aircraft. These jets are fitted in the bows and are used in conjunction with wheel and propeller-pitch control. Obviously, when using reaction, there must be some loss of power at the monitor nozzles, but this amounts only to about eight per cent.

Either of these floats can also undertake salvage operations on flying boats or marine craft with damaged hulls, and for this purpose suction hoses are stowed on deck, conveniently near the appropriate connections and ready to drop into a damaged craft when alongside. The total pumping capacity of either boat for this duty is in the region of 1,300 gal/min.

Prototype No. 1 ("R.A.F.80") is a 55ft boat powered by four 100 b.h.p. diesel engines driving two variable-pitch Rotol propellors. Two engines to each shaft drive through special toothed clutches, enabling either one or both to be used for propulsion and/or pumping. The Rotol propellors are of the three-bladed type and have a diameter of 29in. Blade-angle range is 110 deg, giving limits of 20 deg for astern drive through zero to ahead angles and "feather" at 90 deg.

The second prototype ("R.A.F.81") is a rather larger craft, being 60ft overall with 14ft beam. The hull is of aluminium alloy by Birmabright. Propulsion is by two 225 b.h.p. General Motors diesel engines which drive two Voith Schneider variable and reversible-pitch propellers. The Voith Schneider propeller employs a number of aerofoil blades depending vertically from the periphery of a circular runner which rotates in a horizontal plane. The blade roots are connected to the central control boss of the runner in such a fashion that the blade pitch angle can be varied cyclicly and, therefore, the propeller is capable of delivering thrust in any direction radially from the axis of rotation. With the control concentric all blades are tangential to the runner and, therefore, no directional thrust is produced. It is possible to go direct from full speed ahead to full astern without change of r.p.m. or rotational direction.

For pumping, another diesel engine, similar to that used for propelling, drives two Drysdale pumps, each of which is capable of delivering 500 gal/min. The monitors, of which there are four—two large and two small—all operate through 360 deg in the horizontal plane and 180 deg vertically. By employing full power the total output can be either 5,400 gal/min of foam or 1,000 gal/min of water at 130 lb sq in. Sufficient foam is carried to give a period of operation of eight minutes with all appliances discharging.

"*Flight*" photographs.

Two views of the 60ft Vosper craft. On the left the three forward monitors—one Pyrene and two R.A.F. type—are operating. The ample deck space is apparent, as are the loud-hailer and collapsible mast and coach roof. In the right-hand photograph the fire-float is demonstrating the putting down of a foam barrage on the surface to contain a petrol fire.

MAINTENANCE and SAFETY

A "Must" in Airline Operation : the Problem of Equating it with Economy

By a Service Engineer

IN this age of austerity, when civil aviation is being called upon to play its part in economizing, it is important that, in making its contribution, the industry should maintain its good record and not permit the need for economy to affect its high standards. This applies to constructor and operator alike.

The constructor has in his hands the reputation of the British Aviation Industry. Quality and reliability are his twin aims, and those in touch with the export market, as well as those whose task it is to operate British aircraft on overseas routes, have a very real appreciation of the importance of these attributes in aircraft, engines and accessories.

Few, if any, of those responsible for the handling of airline passengers fail to experience embarrassment when it is necessary to delay a departure, or switch a party of passengers from one aircraft to another because of engine trouble or an airframe snag. People who have paid a large sum of money to be transported from A to B in the shortest possible time cannot be censored if their language is acid when they are delayed. A special measure of tact, too, is required if the passengers are not British nationals.

IN this article a writer of long practical experience in his subject reviews the basic official requirements for maintenance work and inspection. He goes on to show how largely they bulk in operating costs and how the problem affects the British Airways Corporations

The reputation which our airlines enjoy is an indication that these delays do not occur more frequently than in other airlines, and is also further proof that we have very high standards which we must jealously guard. This is an age of rules, regulations and red tape as well as one of austerity, but, nevertheless, we have cause to be thankful for the rules and regulations which have been drawn up to protect all those who fly and are flown. It is only natural that there should be those who complain at certain of the restrictions which the regulations impose, and there have been lengthy and knowledgeable arguments in clubs, hangars and offices regarding the pros and cons of sections of the British Airworthiness Requirements; but in no way does that detract from the fact that the requirements are fundamentally sound, and it would be a rash constructor or operator who attempted to ignore them.

The requirements cover the design and construction of aircraft and accessories as well as maintenance and overhaul. They are mandatory, and under certain circumstances even the organization to meet them is laid down. From the operator's point of view all overhauls, repairs and replacements to aircraft, engines, components, accessories and instruments must be carried out under the supervision of an engineer holding the appropriate licence, or under the supervision of an approved inspection organization. A very high standard is required of the individual engineers before they can obtain their licences, and it is only after a period of practical experience, together with an approved course, that engineers already in possession of licences can be accepted for examination for endorsements to cover the new types now coming into service. The examination consists of a written paper lasting anything up to seven hours, and if the candidate does a satisfactory written paper he is then called for an oral, where he has to further prove his knowledge of the aircraft, engines, electrics or instruments, as the case may be.

An operator wishing to dispense with the necessity of using licensed engineers is given the alternative of working an approved inspection organization. The requirements for the granting of approval are stringent and particular stress is placed on the responsibilities of the chief inspector, who must hold certain qualifications, be thoroughly conversant with the requirements, and be an experienced engineer who can be relied upon to see that the overhaul and maintenance are carried out in accordance with the requirements as laid down. In order that he can have the required authority it is stipulated that he should be responsible to his directors only. In addition, the approving authority must be satisfied that the number and qualifications of the inspectors under the control of the chief inspector are adequate.

Quite apart from the workmanship, the materials and parts used during the maintenance and overhaul of aircraft are subject to strict inspection, and in all cases must be to the approved design and method of construction appropriate to the particular type. An operator may take it upon himself to manufacture, say, a bracket or other detail fitting, but he may do so only by using approved materials, and by placing the manufacture of the part under the supervision of an engineer holding the necessary licence endorsed for the appropriate aircraft type.

The foregoing facts (which will, of course, be well known to those concerned) are emphasized here only in order to support the argument which follows. It is fairly apparent that the most efficient method for an operator to adopt is to have an approved inspection organization, and also to have as many as possible of the engineering and inspection staff fully licensed for the types being operated. This has been the practice in the past and has, to a large extent, been instrumental in providing the efficient maintenance and overhaul organization which has characterized our air operating concerns. Although the most efficient is not necessarily the most economical, and it is here that the danger lies. Those responsible are faced with the problem of maintaining standards while at the same time effecting economies. Efficient maintenance and overhaul spells safety, which in no circumstances must be allowed to take second place. It is better to economize in other directions than to jeopardize a good safety-record by endangering the standard of maintenance and overhaul. Those who fly would without doubt rather feel sure of their safety than be superbly comfortable. The ideal, of course, is a combination of both, but, if we must practice economies, let us ensure that they are practised in the right quarter.

The cost of maintaining and overhauling a fleet of aircraft is always one of the most expensive items an operator is required to face; but if his organization is efficient and his regularity figures are good, it is a cost which he must willingly bear and regard as an investment which pays a big dividend in the form of reliability.

With circumstances such as they are in this country, we cannot work out comparisons between a number of airline operators, as can be done in America, and so obtain some indication of the degree of efficiency in each case; but we can compare our two Corporations and, by basing our comparison on a common denominator, say the usable capacity ton-miles flown, we can get some indication of the items which are proving expensive.

All the information required to carry out a comparison is contained in the reports and accounts for the two Corporations as issued by H.M. Stationery Office, and using the figures for 1948-49—the latest available at the time of writing—we see that approximately 22 per cent of the total cost per usable capacity ton-mile flown in each case was spent under the heading "Flying Operations," which included crews' pay, fuel and oil, and landing fees.

Maintenance and Overhaul, which included direct and

R·F·D LIFE-SAVING JACKET TYPE 50

The latest type of self-righting, pneumatic rubber-proofed cotton life-jacket, designed for use on aircraft and ships.

DETAILS

Jacket complete with securing tapes and mouth inflation	11·62 ozs.
CO_2 Inflation Unit (R·F·D Type) ...	6·73 ozs.
Valise, 9"×3½"×3½"	0·75 ozs.
Life Jacket, total weight	19·10 ozs.
Plastic Whistle and whistle pocket	0·50 ozs.
Waterproof Torch and torch pocket	3·00 ozs.
All-up weight	22·60 ozs.

FEATURES

Buoyancy, 32 lb.
Instant inflation by CO_2 Unit.
Auxiliary inflation by self-sealing mouth valve.
Self-righting, face-to-back position 2½ seconds.
Simple and quick attachment to body.
Strong 2-ply fabric : yellow.
Air Registration Board Approval No. E.1296.

AIR RESCUE AND SURVIVAL EQUIPMENT

A.I.D. Approval Certificate No. 714352/26

R·F·D LTD COMPANY

DESIGNERS & MANUFACTURERS OF INFLATABLE EQUIPMENT SINCE 1920

A.R.B. Approval Certificate No. A1/1708/44

CATTESHALL LANE, GODALMING, SURREY

Phone: 1441 Cables: Airships

Two outstanding aircraft

VICKERS VISCOUNT
D. H. COMET

On March 20th the Vickers Viscount took off on its demonstration flight to the European Capitals—on the following day the de Havilland Comet flew from London to Copenhagen in 78 minutes.

Both used fuel supplied by

Behind the BP trade-mark are all the resources of

ANGLO-IRANIAN OIL COMPANY LTD.

MAINTENANCE AND SAFETY . . .

indirect costs as well as materials and work done by outside contractors, accounted for in one case 18 per cent and in the other case 21 per cent of the total cost per usable capacity ton-mile flown.

Other items of expenditure, such as Station Costs, Passenger Services and Sales and Publicity, together accounted for a further 24 per cent of the total. Approximately 31 per cent was absorbed by such items as Administration, Pre-operational and Development Costs, charter of aircraft and crews, etc.

It is already apparent that vigorous action is being taken by both Corporations to reduce the total cost for usable capacity ton-miles to a more economical figure. One policy which they might profitably pursue would be an all-out drive to increase the sale of seats and freight space, i.e., to increase the load factor, together with a similar but more domestic drive to reduce the 31 per cent of the cost per usable capacity ton-mile flown absorbed in 1948-49 on administration, pre-operational work and development, and on the charter of aircraft and crews, etc.

It has already been said that, given certain circumstances, air transport is essentially a business capable of becoming self-supporting if adequately developed with energy and enterprise. The 1948-49 deficits thrown up by our two Corporations indicate that the amount of energy and enterprise needed will require to be worth over eight million pounds. It seems unlikely that this large annual loss will be completely obliterated—in the case of B.O.A.C., at any rate—in less than seven years' operating under any new organization which is introduced and which contains the required energy and enterprise; but the indications are that those concerned are very alive to the situation.

We must not slip into the defeatist attitude of considering the money spent on our civil aviation over the last five years as thrown down the drain. We now have the finest technicians and the finest aircrews in the world; what remains is to build up a commercial organization to fill the aircraft our engineers provide and our aircrews fly. What would appear imperative is that the commercial side of the Corporations should exert the utmost effort to back up the other departments, while the administrators tackle the continuing problem of reducing administrative costs and introducing economies without in any way lowering efficiency.

When the 1949-50 accounts are published it will be interesting to analyse them and see whether they indicate that such measures have been applied.

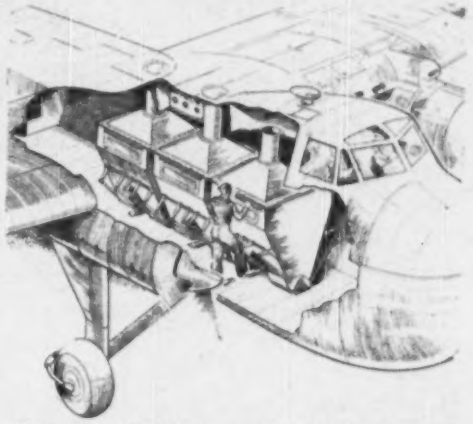
AN AGRICULTURAL IMPLEMENT

More News of the "Freighter Fertilizer"

FULL-SCALE tests have recently been carried out at Filton with a Bristol 170 adapted for the aerial distribution of agricultural dressing material. In the November 24th, 1949, issue of *Flight*, we published the first details of this application of the Freighter, and since that date the Bristol Aeroplane Company have pursued their investigations to the extent of establishing distribution densities. An experimental hopper of one ton capacity has been installed in a Freighter, and pelletted superphosphate dropped over the "Brabazon" runway from varying heights at 125 knots, and with varying sizes of outlet aperture.

The fact that the pavement of the large runway at Filton is made in slabs 20ft square has facilitated the measurement of distribution density. After each dropping operation, the lengths and width of the swathes have been measured and the density of each swathe calculated by the results of sweeping up and weighing the material on each 20ft square of runway pavement across the swathe. In drops from 400ft, an overall swathe-width of 180ft was measured and produced a density of 0.5 cwt/acre extending over 128ft, and a peak density in the centre of the swathe of 3.4 cwt/acre. With a dropping height of 700ft, the overall width of the swathe was increased to 360ft, with an average density of 0.5 cwt/acre over 196ft, and with a peak density of 1.88 cwt/acre in the centre.

The Type 170 is easily able to maintain an annual utilization rate of 1,500 hours, so that one aircraft, equipped with three two-ton hoppers, would be capable of dressing 180,000 acres per annum on the basis of this annual utilization. At a rate of £45 per flying hour, the cost of aerial dressing is calculated as being 7s 6d an acre or £3 15s for each ton of phosphate distributed; or, at a cost of £40 per flying hour 6s 8d an acre, or £3 3s 8d for each ton of phosphate.



This sketch of the Bristol 170 interior shows a suggested installation of three hoppers, each of two tons capacity.

NEW GLAZING PLASTIC

ACCORDING to reports from America, a transparent plastic material of comparatively recent introduction, known as Sierracin, is being widely adopted by airlines, and by at least one aircraft manufacturer, for glazing cabin windows. Eastern Air Lines and Pan American, it is said, are to re-glaze all their Constellations with this material, and T.W.A. have specified it for new Constellations on order. It is also stated that orders have been received from this side of the Atlantic, B.O.A.C. and Air France being named.

Though cheaper than safety-glass, Sierracin is approximately twice as expensive as comparable plastics. A weight-saving of 144lb (for a Constellation's cabin windows) is cited in comparison with glass. Its chief claims are that it is not subject to "crazing" and is not adversely affected by most cleaning compounds or by sealing compounds.

Physical properties claimed include a Rockwell hardness of M60-M100, tensile strength 10,700lb/sq in, flexural strength 16,000—19,000lb/sq in and resistance to continuous heat of from 210 to 225 deg F. Light transmission is given as 89 per cent (refractive index, 1.55). Manufactured by the Sierra Products Co., the new material is distributed by the Moulton Co., Inc., 2310 Winona Avenue, Burbank, Calif.

HYDRAULICS

"Fluid Pressure Mechanisms," by H. G. Conway, M.A., A.M.I.Mech.E., F.R.Ae.S. Sir Isaac Pitman and Sons, Ltd., Parker Street, London, W.C.2. Price 25s.

THE author of this book is the technical director of British Messier, Ltd., and is widely recognized as being one of the leading figures in the hydraulic field. The book provides a comprehensive review of the mechanism of fluid-pressure equipment and systems, but is not concerned with detail design or constructional features so much as with the essential principle of various components, how they work and how they differ from each other. In scope, the subject-matter covers hydraulic, pneumatic and compressed-gas systems of high-, medium- and low-pressure, and there is little doubt that engineers and designers in the aeronautical as well as in the other spheres of mechanical practice, will find the book to be of real value.

It is unfortunate that, in a publication costing 25s, the production should be such that no fewer than eight pages (in the copy we received for review) should have gone through the printing machine twice, and, as a result, be an unintelligible fuzz.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Emergency Tail-Trimming

A NOT uncommon cause of serious aircraft accidents appears to involve a sequence of events which can occur during an approach to a landing. The pilot may decide for some reason—an "under-shoot," or an obstruction on the runway—to make another circuit, and will open up his engines in order to do so. In view of the fact that the tail-trim is set in the tail-down position, however, it is often difficult for him to take the necessary quick action to keep the nose down when the engines are opened up again. The tendency is then for the nose to rise rapidly and flying speed to be lost; unless sufficient height is available, a fatal stall is likely to follow.

It seems apparent, therefore, that an automatic device is required which will re-adjust the tail position when the engines are opened suddenly from idling. Such a modification would serve to avoid the "panic action" now necessary in order to get the tail-trim forward in such circumstances; it would eliminate this cause of fatal accidents should the member of the aircrew responsible be slow to act, or omit to re-adjust the tail altogether.

I remember hearing "Oojie" Soakes, the first pilot to "crazy fly," say in 1917: "Speed never killed anyone while flying." Having stalled an aircraft into the ground while learning to fly the previous year, I made a very earnest mental note of these words of wisdom; and my personal experience during 34 years of practical flying has convinced me that the advice was very sound indeed.

G. V. HOWARD,
(Group Captain, ret.)

London, W.1.

Giants of the Past

MR. GEOFFREY DORMAN'S article, "Size is Relative," in your issue of February 9th, infers from the past growth of aircraft that this evolution will continue in the future; and suggests that misgivings at an all-up weight of 300,000 lb or more may be as groundless as any earlier doubts of 100,000 lb have proved to be.

Such speculations have been supported by reference to the increase in size of other forms of transport, such as ships and locomotives, and also to the performance of aircraft of different sizes in order to show that a continued increase in their size is both possible and desirable.

The argument by analogy in favour of *Queen Marys* of the air is weak, because there is an optimum size, decided under different circumstances for different forms of transport and, apparently, reached already in the case of ships. Whether it has been reached or surpassed in the case of aircraft is an economic issue which should not be beyond solution. When the factor of range is introduced into this argument it is highly significant that the smallest ship, locomotive or other vehicle is adequate, as a machine, to the longest practicable range required of it. Unit size here has been increased for other reasons as a matter of choice. But in the case of aircraft, increase in size is a technical necessity to achieve range, which is achievable in no other way by the aircraft unaided. There is a difference in kind here, traceable to the use of power for lift, which forces the pace in aircraft size irrespective of all other considerations in cases where longer range is required.

This should be warning enough to the civil operator, but, if more is needed, reference may be made to the relations of all-up weight per passenger carried and range, sometimes quoted in favour of the larger aircraft. The striking feature of this relationship is the steep increase of weight per passenger with range, which is only ameliorated to some extent by increase of total weight. The very large aircraft at its best is much worse off than the smaller one, both being "designed for the route." Against the former, too, are the very high development costs and the "one-off" operating charges associated with a prodigy.

The achievement of producing very large aircraft as an exercise in aeronautical science is one thing; their use for military or technical purposes is another; and their use as money-making transports in the "tea-and-kipper" trade, which is the professed goal of civil aviation, is yet a third. It would be very much in the interest of civil aviation and less confusing to the general public if these three conceptions could be kept completely clear.

Ferndown, Dorset STANLEY D. McDONALD.

LIKE your correspondents Messrs. Stroud, Edney, Kappey and Houlding, I was particularly interested to study, in *Flight* of February 9th, Geoffrey Dorman's "Size is Relative" survey of notable "giants" of the past decade. It would seem, however, that your contributor has made a number of omissions apart from those already mentioned by the above readers. For instance, he does not make even the briefest reference to the following American "giants"—such as these aircraft were at the time of their prototype completion and first flights: 1923, Barling NXBL-1 triplane (span 120ft, a.u.w. 42,500 lb); 1935, Martin 130 Clipper (157ft, 52,000 lb); 1937, Boeing XB-15 (149ft, 70,700 lb); 1938, Boeing 314 Clipper (152ft, 84,000 lb); 1941, Douglas XB-19 (212ft 160,000 lb); Martin PB2M Mars (200ft, 148,000 lb).

Apart from the above examples, the following widely known American types can be added, since all of them have contributed outstanding technical advances in the designing and building of really *big* aircraft: Boeing XB-10, Douglas C-74 (DC-7), Boeing 377 or XC-97, Lockheed XR-60, Convair XB-36.

So much for the numerous American "heavies." Other foreign giants which I believe worthy of even the briefest reference are: 1933, Latécoère 521 (150ft, 85,000lb); 1934, Junkers G-38 (120ft, 53,000 lb); 1937-38, Focke-Wulf Condor (108ft, 50,000 lb); 1939-42, Latécoère 631 (188ft, 157,000 lb); 1940, Blohm and Voss Bv 222 (157ft, 101,000 lb); 1943, Blohm and Voss Bv 238 (197ft, 198,000 lb).

In regard to the Latécoère 521, which first flew in 1933, this huge flying-boat could almost be described as the French aircraft industry's answer to the German DoX—the design of the hull and wing shape bore more than a superficial resemblance to the German boat. The L.521 had six motors, however, four tractors and two pushers.

Both the German Blohm and Voss 222 and 238 flying-boats were six-motored, and, as readers are well aware, many examples of the 222 "Wiking" were shot down by Allied aircraft in the Mediterranean theatre of war. Technical details of the only two prototype 238s are scarce, but it seems (according to *Janes*') that both of them were destroyed by Allied raids on Hamburg in 1943 and 1944. At least one 222 was brought over to Calshot and tested by the R.A.F. technicians from Farnborough.

Quite obviously it is impossible for the writer to make more than brief reference to the many types of "giants of the past" listed above—but here, surely, is plenty of "food for thought." Commendable as Mr. Dorman's article was, I do sincerely feel that his survey was somewhat biased in favour of the products of the British industry and, because of this, he overlooked a wealth of material from the U.S.A., Germany and France which surely deserves more than casual study!

Prestwick, Ayrshire. DENNIS M. POWELL.

[Our correspondent gives much additional data, which cannot be included here, on the types he mentions above. While acknowledging the enthusiasm of Mr. Powell and other aerophiles, we must now reluctantly call a halt to this correspondence.—ED.]

Crockery Corner

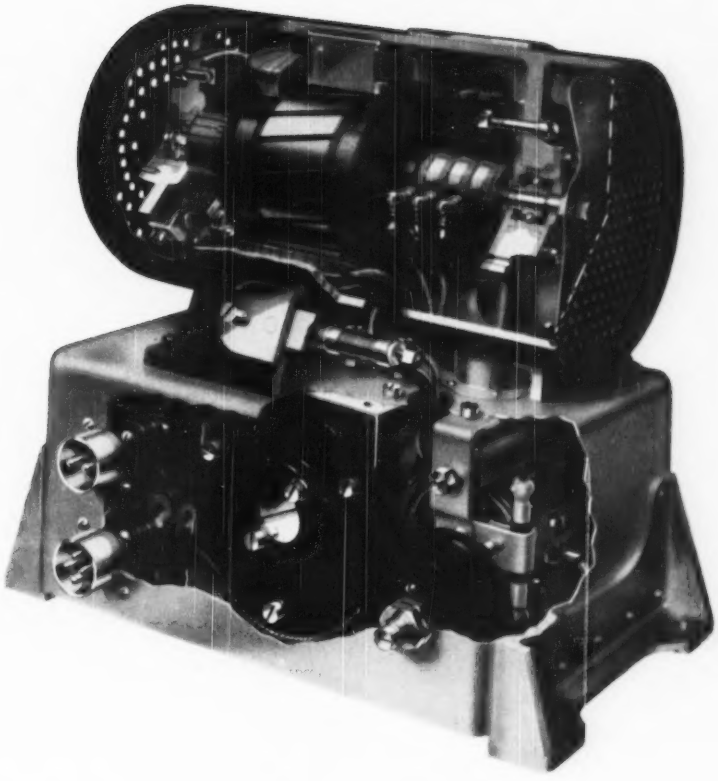
THE seriousness of the recent stepping-up in flying-saucer incidence has not yet been properly related to cosmic events. From March 27th to (I think), appropriately, April 1st, the planet Mars is closer to the earth than for many years. Obviously, the recent recurrence of the saucers coincides with the need of the Martians to "recce" the short crossing of 60 million miles before launching an opportunist invasion against the earth. Even now, undoubtedly, some 22-inch Montgomery is inspecting his earth-landing craft in some Martian Southampton Water, and asking anxiously about the ether tides.

Earlier saucers with 38-foot air intakes, were, of course, on very special duty, as the Martian Farnborough had urgent and obvious need to consult Sir Frank Whittle on the problems of entry flow. That they landed in Mexico was due to poor Intelligence work on the exact location of the National Gas Turbine Advisory Committee, or perhaps to navigating on Newtonian rather than Einsteinian space-charts.

At any moment now the invasion may be on us, so, Sir, let it be said of your journal that, in what may be its final issue, it Appreciated the Truth.

CHARLES GARDNER.

London, W.1.



Steady Frequency and Voltage

Certain aircraft instruments and equipment, such as the distant-reading compass, require a 400 cycle supply, free from variations in frequency and voltage—and cannot, therefore, be operated from engine-driven generator supplies.

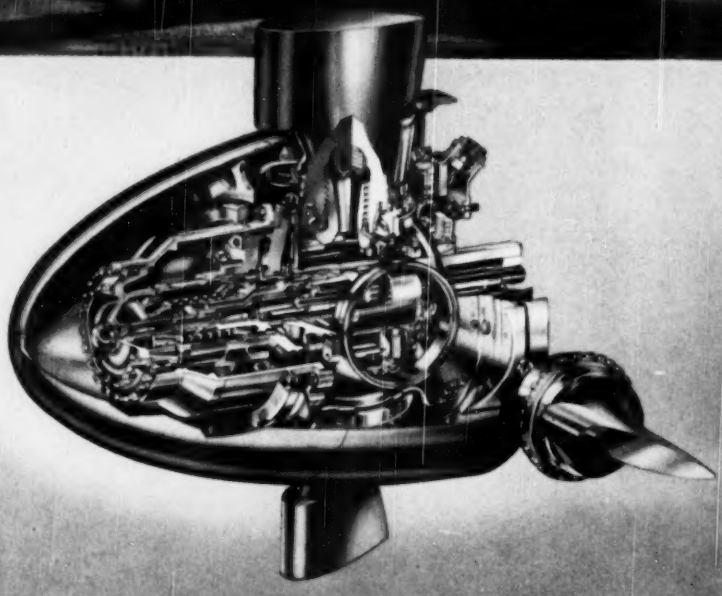
MOST BRITISH AIRCRAFT RELY ON ROTAX INVERTORS TO SUPPLY THESE SERVICES

Operating from a 24 V. D.C. supply, this S.2901 Invertor weighs only 10 lb. and gives an output of 150 V.A. (120 W., .8 p.f.) at 115 V., 3-phase, 400 cycle. Output frequency and voltage do not vary by more than 1% irrespective of fall in battery voltage from 29 V. to 25 V.; decrease slightly with fall between 25 V. and 22 V. Other Invertors, with larger outputs, are used to operate fluorescent lighting.

ROTAX

Complete Electrical Systems and Equipment for Aircraft

ROTAX LIMITED, WILLESDEN JUNCTION, LONDON, N.W.10, ENGLAND
ROTAX AUSTRALIA PTY., 81 BOUVERIE STREET, MELBOURNE, N.3, VICTORIA — ROTAX CANADA LIMITED, MONTREAL AIRPORT, DORVAL, P.Q.



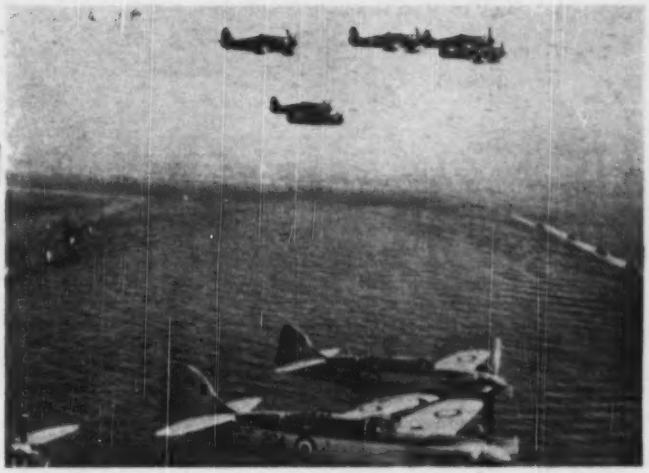
Rotol Propellers are on the Vickers "Viscount"—the World's first Turbine Propeller Powered Airliner to fly and the first of its type to be granted a British Normal Category Certificate of Airworthiness.

ROTOL

GLOUCESTER • ENGLAND

SERVICE AVIATION

Royal Air Force and Naval Aviation News and Announcements



AT EXERCISE: Fireflies and Sea Furies of the 14th Carrier Air Group (H.M.S. *Glory*) are seen over Palmas Bay, Sardinia, and ships taking part in the recent combined manœuvres of the Home and Mediterranean Fleets. As mentioned below, the R.A.F. is now taking part in further Home Fleet exercises.

Helicopters for Malaya

THE Air Ministry announces that three Westland-Sikorsky S-51 helicopters for the R.A.F. Casualty Air Evacuation Flight in Malaya are now *en route* to Singapore. Equipped with two external stretchers each, the S-51s will probably be based at Kuala Lumpur and Butterworth, and will use advanced landing strips or jungle clearings to evacuate casualties suffered by anti-bandit patrols.

R.A.F.A. Annual Report

IN the annual report of the Royal Air Forces' Association, Air Marshal Sir Robert Saundby, chairman of the Association's national council, stresses the need for enrolment of more members and the establishment of more branches. If the R.A.F.A. were to double its membership, he states, it could at once overcome almost all its difficulties. Sir Robert points out that well over 50 per cent of those assisted by the Association in 1949 were not members.

"War" in S.W. Approaches

SUNDERLANDS of Coastal Command have been patrolling the Atlantic throughout this week, in simulated operations against submarines preparing to "attack" the Home Fleet on its way from Gibraltar. As the Fleet neared South-Western England, Coastal Lancasters, which have also been operating against submarines, were due to change sides and oppose the surface vessels. In addition, Bomber Command Lincolns are taking part in the final phase of the exercises, which are scheduled to end tomorrow.

Seconded to Denmark

SQUADRON LEADER ALISTAIR LANG, who until recently was the regular adjutant of No. 615 (County of Surrey) Squadron, R.Aux.A.F., has been seconded for service with the Royal Danish Air Force as a jet-fighter specialist. His headquarters will be at Copenhagen. The new adjutant with No. 615 is F/L. Thorogood.

Prisoners' Reunion

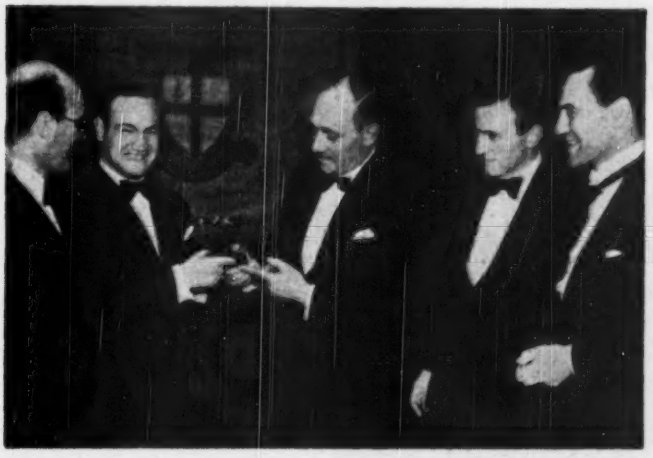
THE Royal Air Forces Association is holding a reunion for all ex-prisoners of war from Germany, Italy and the Far East. In the form of a cabaret and ball, the reunion will take place from 7 p.m. until midnight at the Royal Albert Hall, London, on Friday, April 14th.

During the evening, Mr. Oliver Philpott, the "Phillip Rowe" in Eric Williams' classic escape novel *The Wooden Horse*, will demonstrate escape with a replica of the famous vaulting horse (but will not, presumably, tunnel under the dance-floor!). In addition, several well-known stage, film and radio artistes have lent their support to the reunion. Tickets (7s 6d) for the reunion may be obtained from the Royal Albert Hall or the Headquarters of the R.A.F.A. at 83, Portland Place, London, W.1.

Northern Ireland Ceremony

FOR nearly three years—from June, 1942, until May, 1945—the Senate Chamber of the Northern Ireland Houses of Parliament was used as the operations room for No. 82 Fighter Group of the R.A.F. To record the gratitude of the British Government to the Northern Irish Speaker and Senate for placing the Chamber at the disposal of the R.A.F., Mr. Arthur Henderson, Secretary of State for Air, last week unveiled a commemorative inscription in the former scene of operations.

The ceremony, on March 23rd, at Stormont, Belfast, was presided over by Viscount Bangor, Speaker of the Senate, and attended by Sir Basil Brooke, North-



"Flight" photograph

PRESENTATION PIECE: The colours of No. 600 Squadron were an appropriate background to the recent ceremony (see paragraph overleaf) at which the Bristol Aeroplane Company presented the unit with a silver model of a Beaufighter. Among those present were: (left to right) Lord Mottistone, S.L. David Proudlove (commanding officer), Mr. R. S. Brown (Bristols), W.C. T. N. Hayes and Lord Malcolm Douglas-Hamilton, M.P.

SERVICE AVIATION . . .

ern Ireland Prime Minister, members of both Houses and a number of senior R.A.F. officers, including Air Marshal Sir Basil Embry, A.O.C.-in-C., Fighter Command.

Youth in Reserve

SUBJECT to the prior consent of their parents, young women between the ages of 17½ and 18 may now join the Women's Royal Air Force Volunteer Reserve and the Women's Royal Auxiliary Air Force. The Air Ministry announced recently that youths of 17 are now eligible for enlistment in the R.Aux.A.F. and R.A.F.V.R.

Honorary Appointment

THE Rt. Hon. the Earl of Cranbrook, D.L., J.P., has been appointed Honorary Air Commodore of No. 3619 (County of Suffolk) Fighter Control Unit, R.Aux.A.F. No. 3619 F.C.U. is commanded by W/C. R. B. George, C.B.E., D.S.O., and its headquarters are at the Municipal Airport, Cambridge.

Squadron Presentation

THOSE who read the history of No. 600 (City of London) Squadron, R.Aux.A.F. (*Flight*, November 3rd, 1949) will recall the part played by Bristol aircraft in the Squadron's night-fighting operations during the war. At the outset it was equipped with fighter Blenheims and later achieved a wonderful record with Beaufighters.

On Wednesday of last week, at the unit's town headquarters, Finsbury Barracks, Mr. R. S. Brown, the general manager of Bristol's Aircraft Division, dined-in with the officers and presented them with a silver model of a Beaufighter to add to their collection of silver models of past Squadron aircraft. A photograph of the presentation appears on page 419.

W.R.A.F.—U.S.W.A.F. Exchange

AN exchange-posting scheme has recently been arranged between the W.R.A.F. and the United States Women's Air Force. The first American women officers to come to England under the scheme arrived here on February 18th, and five W.R.A.F. officers sailed for America on the *Queen Elizabeth* last week. The W.R.A.F. officers, who will serve at separate U.S.A.F. stations in Washington, D.C., Illinois, Texas and New York, are: Sq/O. M. F. Goodworth, Flt/O. G. E. Campion, Flt/O. J. Borlase, M.B.E., Flt/O. A. Penfold, M.B.E., and Flt/O. J. Mc.D. Jeffers.

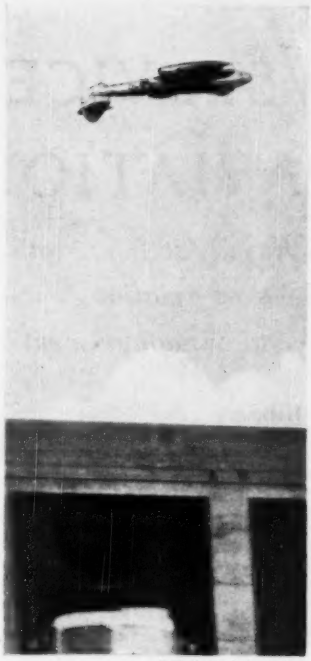
R.A.F. Appointments

AIR COMMODORE A. P. REVINGTON, C.B.E., Air Officer Commanding No. 46 Group, Transport Command, has been appointed Senior Air Liaison Officer with the United Kingdom Service Liaison Staff, Canada, and will take up his new duties about June 1st. During the war, A. Cdre. Revington served with Coastal Command at home and in Iceland, and also spent nearly four years in the Middle East.

On his return to the United Kingdom after the war he became Deputy Air Officer in Charge of Administration at H.Q., Transport Command, in January, 1946, and afterwards commanded No. 4 Group from October, 1946. He has commanded No. 46 Group since January, 1948. A. Cdre. Revington, who is 48, was in the first entry of cadets at Cranwell, in 1920.

It is also announced that G/C. R. L. S. Freestone, O.B.E., who was until recently Director of Armament at the Air Ministry, with the acting rank of air commodore, has taken up an appointment at Headquarters, British Air Forces of Occupation, Germany, as Senior Technical Staff Officer, with the same acting rank. Aged 45, A. Cdre. Freestone joined the R.A.F. in 1921 as a boy, and was commissioned eight years later.

For some time before qualifying as an armament specialist in 1932 he was a flying instructor at the Central Flying School. From August, 1938, until early in 1940, he was in the Directorate of Technical Development at the Air Ministry, and he was afterwards in Australia for three years as Director of Training at R.A.A.F. Headquarters. Later he served at the Ministry of Supply and as R.A.F. member of the Ordnance Board. He returned to the Air Ministry in July, 1948, as Deputy Director of Technical Plans and became Director of Armament in April, 1949.



"Flight" photograph.

STRAP-HANGER: A recent meeting of Regular and Auxiliary squadrons at Horsham St. Faith provided a preface to the forthcoming season of air displays, when one of the resident pilots, F/L. Lynes, gave an impressive demonstration of the Meteor 4. In the fly-past shown above, his aircraft remained inverted for the full 15 seconds' period permitted by the inverted-flight fuel-supply system.

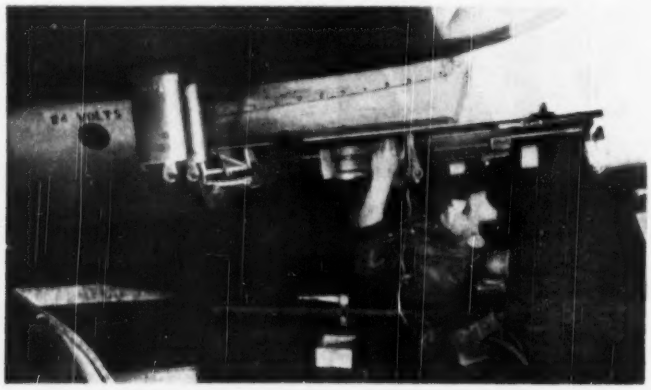
For Armament Instruction

HARVARDS and Masters in use as dual gunnery trainers are shortly to be replaced by Avro Athenas and Boulton Paul Balliols. The new trainers are from the small pre-production batches delivered by the makers of each aircraft for comparative flying trials, held recently to determine the R.A.F.'s choice of a new advanced trainer. Following close competition between two excellent aircraft, the Balliol was finally selected for full production. Both types are Merlin-powered.

The Athenas will be assigned to the R.A.F. Flying College at Manby (the new establishment which combines the three "Empire" schools of flying, navigation and armament), and the Central Gunnery School at Leconfield will receive Balliols. The new trainers, having side-by-side seating, should make the instructors' work considerably easier.

Reunion

NO. 2 Group Officers' Association (R.A.F.).—Reunion dinner at 6 p.m. on May 13th, at the Park Lane Hotel, London. Tickets one guinea (subscribers 15s) from E. H. Dickens, Ebersfield, Kenton Gardens, Kenton, Middlesex.

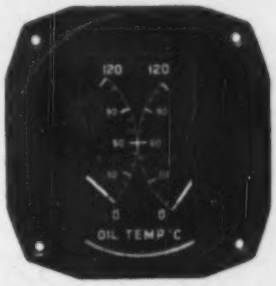


THE WORKS: An unusual glimpse of the four-Hispano gun installation of a Vampire 5—one of 2 B.A.F.O. squadron—as it receives routine attention from an armourer.

No. 1 Temperature Measuring

The comprehensive range of Weston temperature measuring instruments covers the requirements of existing production aircraft, as well as types now under development. In addition to thermometry for the indication of cylinder, air, oil and radiator temperatures, Weston equipment for aircraft includes instruments for power supply, navigational aid instruments, selector switches, etc.

WESTON
AIRCRAFT INSTRUMENTS



Illustrations show :

Above : Model 5138. Dual Engine Temperature Indicator, comprising two Millivoltmeters of 180° scale housed in large-size S.A.E. case. For use in conjunction with copper/constantan, iron/constantan or chromel/alumel thermocouples.

Below : Model 5127. Dual Ratiometer Indicator, comprising two 180° Ratiometer movements housed in large-size S.A.E. case. For use in conjunction with thermometer bulbs, electrical oil pressure transmitters, electrical position indicators or any combination of two of these to indicate a variety of temperatures, pressures or positions.

SANGAMO WESTON LIMITED
Enfield, Middlesex.
Tel.: Enfield 3434 (6 lines) and 1342 (4 lines). Telegrams: Sanwest, Enfield.
Scottish Factory : Port Glasgow, Renfrewshire, Scotland.

Area Depots : 201 St. Vincent Street, Glasgow. Tel.: Central 6208.
Milburn House, Newcastle-on-Tyne. Tel.: Newcastle 26867.
23 Booth Street, Manchester. Tel.: Central 7904.
33 Princess Street, Wolverhampton. Tel.: Wolverhampton 21911.

Multum in Parvo — MUCH IN LITTLE

Teddington CONTROLS

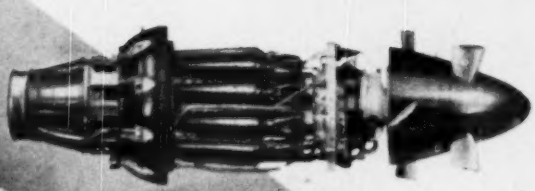
None of our productions are very large and their weight too is generally measured in ounces, but these physical quantities are no measure of the thought which has gone into their design and the care which is put into their production. Indeed we can say of them all "multum in parvo."

TEDDINGTON CONTROLS LTD

CEFN COED. MERTHYR TYDFIL SOUTH WALES

ARMSTRONG SIDDELEY
Gas Turbine Propeller Engines

Python and Mamba



fitted with

'Tungum' Trade Mark BRAND ALLOY

TUBING

Unquestionably reliable

TUNGUM SALES COMPANY LIMITED
Brandon House · Painswick Road · Cheltenham · Glos.

URGENT

WANTED BY

FLIGHT REFUELLING LTD.

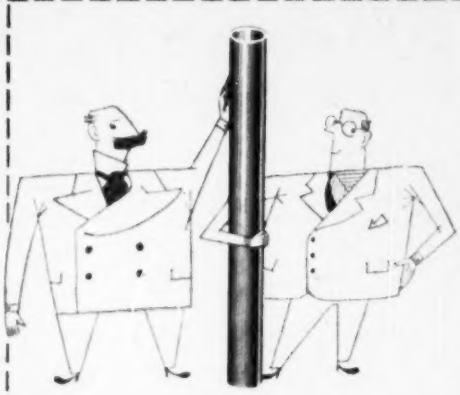
SKILLED DESIGNERS, DRAUGHTSMEN AND TECHNICIANS

INTERESTING WORK ON MODERN TECHNICAL DEVELOPMENT

GOOD PAY AND PROSPECTS

Send full particulars to the Personnel Manager (Dept. T.D.)
AT TARRANT RUSHTON AIRFIELD, BLANDFORD, DORSET

Telephone BLANDFORD 501

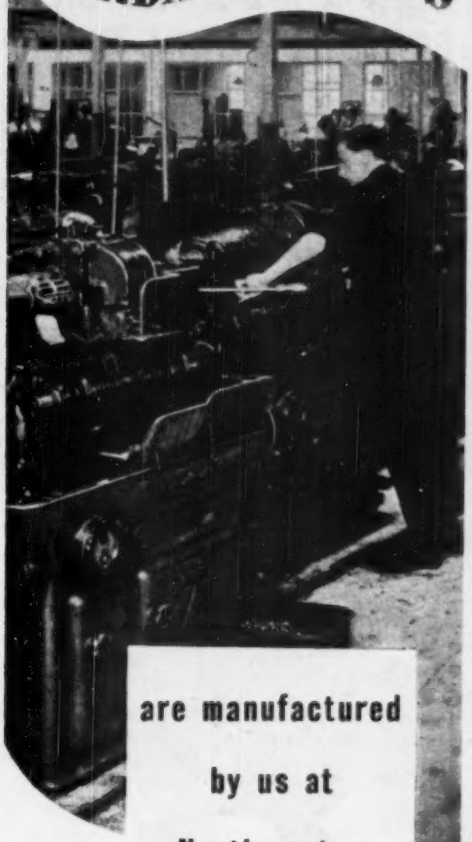


ACCLES & POLLOCK
really spread themselves

when it comes to making a good precision job of stainless and other steel tubes for aircraft.

ACCLES & POLLOCK LTD · OLDBURY · BIRMINGHAM · A TI COMPANY

The complete ranges of
AGS · BSS and SBAC
STANDARD PARTS

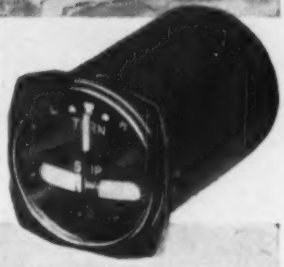


are manufactured
by us at
Northampton

Brown Brothers (AIRCRAFT) Ltd.
Aircraft and General Engineers
HOUGHTON ROAD · NORTHAMPTON

The first and only Electrical Turn and Slip Indicator approved for service with the R.A.F.

"Proving your indicators are in every way satisfactory on the Armstrong-Whitworth Apollo."



PULLIN *Precision*
ELECTRICAL TURN & SLIP INDICATORS

1000 hours between Overhauls
For full details write direct to the Sole Manufacturers
R. B. PULLIN & CO. LTD.
PHOENIX WORKS, GREAT WEST RD., BRENTFORD MIDDX.
Telephone: EALing 0011/3 & 3661/3
Telegrams: Pullinco, Wesphone, London.

The Vickers 'Varsity'

THE PROTOTYPE

'VARSITY' TRAINER

INCORPORATES

MARSTON EXCELSIOR

'FLEXELITE' FLEXIBLE FUEL TANKS

'FLEXELITE'	The new type flexible fuel tank
'MAREX'	Brazed light alloy heat exchangers

MARSTON EXCELSIOR LTD.

FORDHOUSES, WOLVERHAMPTON

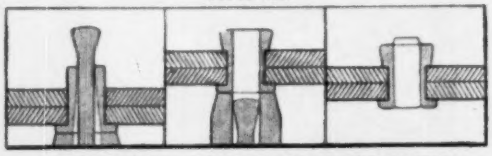
(A subsidiary company of Imperial Chemical Industries Ltd.)

MAR. 86

The CHOBERT System of RAPID RIVETING

E-X-P-A-N-D-S THE SHANK FOR A PRESSURE TIGHT FIT

Spectacular savings in time and money can be achieved with the tried and tested Chobert Automatic (Pneumatic or Mechanical) system of rapid riveting. Up to 2,000 rivets can be placed in one hour by comparatively unskilled labour. Each shank expands as it is driven home and FILLS the hole for a pressure fit. "Blind" positions can be riveted and only one side of the work need be accessible. Available in Light Alloy and Steel in a full range of sizes up to ⅜" dia. Absolutely trouble-free equipment and a 24-hour free service.



SAVE TIME! AVDEL SHEET GRIPPERS

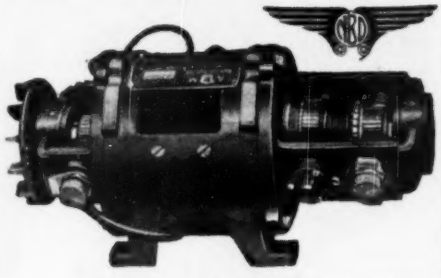
Fixed in a flash. *Hold the sheets fast.*

AVIATION DEVELOPMENTS LIMITED,

Kingsbourne House, 229/231, High Holborn, London, W.C.1.

Tel. CHAncery 8681 (8 lines)

NEWTON-DERBY



A typical N.B.D. Rotary Transformer

ROTARY TRANSFORMERS

Are highly efficient machines and of minimum weight consistent with reliable performance. We invite you to consult us with your power problems for radio receiving or transmission, public address systems, television, radar, and other electronic equipment.

ELECTRICAL PLANT SPECIALISTS

NEWTON BROTHERS (DERBY) LIMITED

H34

FIRTH-VICKERS

"Stayrite"

AND

STAINLESS STEELS

Firth-Vickers produce their world famous steels in the form of Bars, Sheet, Strip, Castings and Forgings for a wide range of applications.

Our Research Organisation is available for advice and assistance on your problems and in the meantime we suggest you ask for publication No. 108/1, which gives in a very concise form much useful technical data.

FIRTH-VICKERS STAINLESS STEELS LTD., SHEFFIELD

Telephone No. Sheffield 42011

DAKOTA OPERATORS

ARB APPROVED

Obtain the mandatory British C. of A. requirement Fire Modifications— Nos. 101 to 105 inclusive.

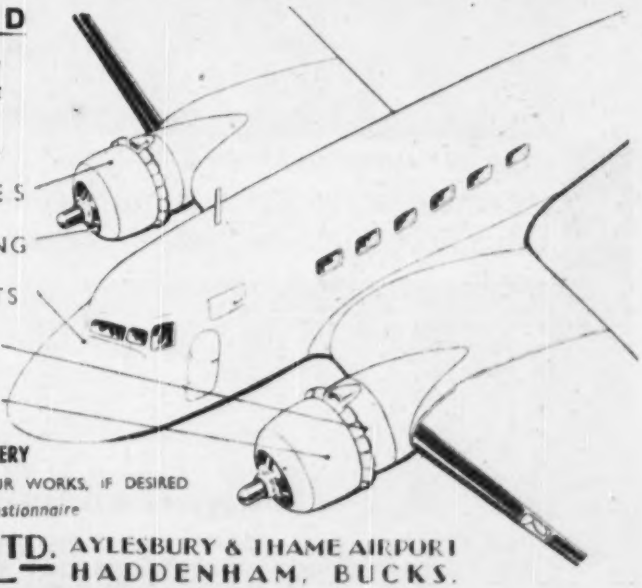
FIREPROOF HOSES

PROPELLOR FEATHERING

FIRE WARNING LIGHTS

FIREPROOFING - FIREWALL

FIRE EXTINGUISHER SYSTEM



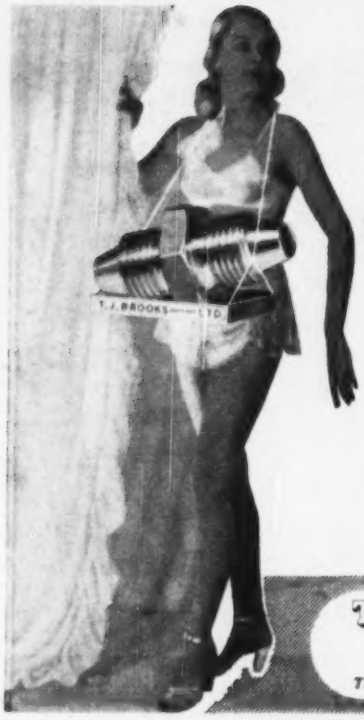
AVAILABLE FOR IMMEDIATE DELIVERY

CONVERSIONS UNDERTAKEN AT OUR WORKS, IF DESIRED

Write at once for Questionnaire

AIRTECH LTD. AYLESBURY & THAME AIRPORT HADDENHAM, BUCKS.

Aylesbury 1165



a break for the Backroom Boys

. . . . and others who so seldom see the outside world. The illustration on this page is of Woman — delightful, diverting, disturbing. The article on the tray is a Brooks' component — true, tried and tested. The manner of delivery shown cannot be guaranteed, but Brooks' components always turn up on time.

T. J. BROOKS (AUTOS) LTD.
LEICESTER
Telephone: 60987
The most progressive name in component manufacture

RIVETS & WASHERS

IN COPPER - ALUMINIUM - LIGHT ALUMINIUM ALLOYS, & DURALUMIN. SPLIT COTTER PINS IN STEEL, STAINLESS STEEL & NICKEL ALLOY NON-CORRODIBLE MATERIALS

D. POWIS & SONS LTD.

CONTRACTORS TO THE AIR MINISTRY, ADMIRALTY, Etc.
ESTABLISHED 1884

FORWARD WORKS, GOLDEN HILLOCK ROAD
SPARKBROOK BIRMINGHAM
TELEPHONE VICTORIA 1284-5 • TELEGRAMS POWIS, BIRMINGHAM

FLIGHT

CLASSIFIED ADVERTISEMENTS

Prepaid Advertisement Rates: 3/- per line, minimum 6/-, average line contains 6-7 words. Special rates for Auctions, Contracts, Patents, Legal and Official Notices, Public Announcements, Tenders, 6/- per line, minimum 9/- per paragraph. Box Number facilities available for the convenience of private advertisers, add 2 words plus 1/- to defray the cost of postage and forwarding replies. Press day for April 6th, FIRST POST THURSDAY: Press day for April 13th, FIRST POST, WEDNESDAY, APRIL 5th, or one day earlier at Branch Offices. No responsibility accepted for errors. Remittances payable to: Iliffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1.

GAUNTLET GLOVES

No. 888A, as illustrated. A fine stout horsehide gauntlet, FULLY LINED with soft warm imitation lamb-wool. Gussetted fingers to ensure comfort and free movement; with adjustable strap wrist; a first class motor-cycle gauntlet. In black or tan horse-hide. 56/-. With Warm Fleece Lining, 39/6. Brand New ex-R.A.F. wide-vision **GOGGLES, 24/6.** Spare lenses tinted or clear, **2/6.** Brand New latest type ex-R.A.F. anti-glare sun spectacles **21/-.** R.A.F. type Electrical inter-communication sets in stock. Perfectly new ex-R.A.F. **FLYING GAUNTLETS.** Soft cape leather, warm fleece lining. Complete with Black Silk Worm Camel-lined electrically heated **INNER GLOVES.** Worn together they make the warmest glove obtainable, **28/9.** White silk inner gloves, **4/9.** Fully sheepskin lined Tan Leather Gauntlets, strap wrist, **50/-. LEATHER JACKETS of all types in stock.** New Black or Tan all-leather **FLYING BOOTS** lined throughout warm sheepskin, **16/6/-. WHITE FLYING SUITS** now in stock. Zip front, cuffs and ankles. All round Belt. In good quality white drill. Specially cut for comfort and comfort, **79/10. SPECIAL QUOTATION MANUFACTURERS AND FLYING CLUBS.** Genuine ex-R.A.F. Irvine Jackets, sheepskin or fur lined, now in stock. American white lambswool lined **FLYING JACKETS**, first-class selection, from **105/-.**

All goods are sent POST FREE.

QUICK SERVICE SPECIAL TERMS TO FLYING CLUBS—SECRETARIES. WRITE FOR PARTICULARS NOW.

Send 3d. in stamps for NEW CATALOGUE.
Trade Supplied.

D. LEWIS LTD. (Dept. F.)

Leather Clothing Manufacturers for Home or Export

124, GT. PORTLAND ST., LONDON, W.1

Trade Enquiries Invited.
Tel: Museum 4314. Tele: Autokit, Wesdo, London.

AIRCRAFT WANTED

W. S. SHACKLETON, Ltd., have instructions from overseas clients to purchase several Messenger and Gemini aircraft; owners willing to sell please send full details; machines must be in perfect condition with or without Certificate Airworthiness but preference given to machines with low hours, fitted extra equipment and accident-free since birth.
W. S. SHACKLETON, Ltd., 175, Piccadilly, London, W.1. [4790

AIR CHARTER

BROOKLANDS AVIATION, Ltd.—Proctors and Rapides available for air charter at Brooklands Aerodrome, Weybridge (Tel. Byfleet 436); Sywell Aerodrome, Northampton (Tel. Moulton 213511); Shoreham Airport, Sussex (Shoreham 2366). [0806

BOOKS, ETC.

"FLIGHTS," Jan., '46-Dec., '46, for sale; best offer —17, Queens Rd., Walton-on-Thames, Surrey. [4795

JANE'S 1943-44 and '45-'46, as new, 45/- each; 67 "Flights," '82 "Aeroplanes," running 1945/49, perfect, 50/-; 225 clean Spotters; s.a.e. for details.—Holderness, 32, Eithorne Rd., Uxbridge, Middx. [4796

AIRCRAFT FOR SALE

FIELDS

SEE our Display Ad. Special Offer of New Proctor Aircraft.—Field Aircraft Services, Ltd., Croydon Airport, Croydon 2777. Cables, Fieldair. [0258

R. K. DUNDAS, Ltd.,

AVIATION Division, 39, Bury St., London, S.W.1.

FOR all

AIRCRAFT and spares,

AIRCRAFT and aerodrome equipment,

29, Bury St., London, S.W.1.

WHITEHALL 2048.

[0556

F. G. MILES, Ltd., Redhill Aerodrome, Surrey. Nutfield Ridge 2260.

TWO Miles Gemini Mark 1A with 12 months' C. of A. available shortly; these machines are at present being overhauled and reconditioned in our works by Miles craftsmen; enquiries invited for details.

F. G. MILES, Ltd., Redhill Aerodrome, Surrey. Nutfield Ridge 2260. [0590

MARK I Anson ex-R.A.F., but fully modified; cheap to clear.—Box 2512. [4789

PROCTOR III, 86 hours engine, airframe 351 hours, choice of colour; immediate delivery, 12 months C. of A.; £595.—Below.

TIGER Moth, engine nil hours, airframe 274 hours, with or without C. of A.—Vendair, Croydon Airport. Ops. 3777. [4802

A FAIRCHILD-ARGUS, long-term C. of A., re-upholstered and soundproofed, a magnificent 4-seater aeroplane; best offer secures.—Box 2509. [4788

FOR sale, two Piper Cub 'planes with spare engines recently overhauled, expired C. of A.—Particulars Frank G. Bowen, Ltd., Auctioneers, 15, Greek St., W.1. [4751

PROCTOR V, immaculate condition, beautifully maintained, without C. of A.; £400.—Write William Wilson & Sons, Ltd. Silver Cross Works, Guiseley. Tel. Guiseley 390. [4804

ANSON Mark I freighter; early delivery with 12 months' C. of A.; fully modified with low hours, both airframe and engine; T/R 1154/55 radio; payload 1,945lb; £995; 7 passenger seats can be fitted if required. Box 2511. [4787

SEA Otter single-engine amphibian, brand new, test flown only 5 hours; practically completed C. of A.; for sale as lying England; sacrifice price £5,500.—Autocars (Worcester), Ltd., Aircraft Division, 51, Sidbury, Worcester. [4757

A SUPERBLY fitted Anson Mk I for sale, 8 passenger seats, upholstered and soundproofed by Rumbold, long-term C. of A.; radio VH/TR/1148 and T/R 1154/55; readily convertible as a freighter; best offers over £1,350.—Box 2510. [4786

OWING to B.E.A superseding our schedule service we have Rapide Aircraft for sale; 8 passenger seats; 6 Channel V.H.F. radio with B.B.A. and C. of A.; offers invited.—Patrick Motors, Ltd., 479, Bristol Rd., Birmingham, 29. Tel. Selly Oak 1104. [0594

TIGER Moth for sale, aircraft as new, 12 months' C. of A., engine 42 hours in 100% condition, colour silver-red registration marking and struts, available demonstration 8.3.'47; best offer over £1,250.—Hereford Aviation Centre, Ltd., Hereford Airfield. [4792

AUSTERS! Austers! Austers!—If you want a really good used Auster write or 'phone us; we, as the makers, only sell the best used aircraft for whose condition we can vouch.—Auster Aircraft Co., Ltd., Rearsby, Leicester. Tel. Rearsby 276; Caddesby 271. [0454

RAPIDES, 4 available, 5 ex-R.A.F., offered with or without C. of A. at low prices; also one each of the following: twin-engined D.H. Dragonfly, Messenger, Chrislea Ace Mk. III, Leopard Moth, Puss Moth and Stinson Voyager; current C. of A.s; local inspection, spares, overhauls, hire purchase, part exchange.
FLIGHTWAYS, Southampton Airport. Tel. Eastleigh 87669 [4752

continued on next page

IMPORTANT GUIDE

This unique Handbook "Engineering Opportunities" outlines over 200 home-study Courses of technical instruction, including **Aeronautical Engineering, Aeronautical Design, Aero Engines, Air Navigation, Aircraft Engineers' Licences (Ground Engineers), A.F.R.Ae.S., A.M.I.Mech.E., R.A.F. Maths**, etc.
Our courses have been approved by the **Royal Aeronautical Society** and

WE GUARANTEE

"NO PASS—NO FEE"

A copy of this enlightening guide to well-paid posts will be sent on request—**FREE.**

British Institute of Engineering Technology
306, Shakespeare House, 17-19, Stratford Place, London, W.1.

B.I.E.T.

HOME STUDY TECHNICAL TRAINING

for A.F.R.Ae.S., A.R.B. LICENCES, A.M.I.Mech.E., CITY & GUILDS, etc.

T.I.G.B. offer thorough and reliable Home Study Courses for A.F.R.Ae.S., A.R.B. Licences and many other professional Examinations. We have also a wide range of Diploma Courses in most branches of Engineering. Tuition can begin from an elementary or more advanced stage, and all necessary text-books, blueprints, etc. are provided by the Institute.

40 FIRST PLACES HAVE BEEN WON BY T.I.G.B. STUDENTS IN THE ROYAL AERONAUTICAL SOCIETY EXAMINATIONS

SEND FOR FREE 110-PAGE PROSPECTUS

If you will kindly state subject of interest and training to date (if any), we shall be pleased to send you a complimentary copy of our 110-page Programme of Studies. Your application places neither you nor the Institute under any obligation.

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN

TIGB

97A TEMPLE BAR HOUSE, LONDON, E.C.4

AIRCRAFT FOR HIRE

FOR hire

AUSTER Autocrats

£15 per wk., £50 per 4 wks.

PROCTOR 3, £20 per wk., £70 per 4 wks.

RAPIDE, £5 per hr., £75 per wk., £250 per 4 wks.

MAINTENANCE, insurance, hangarage, petrol and oil; liability hirer.—Hereford Aviation Centre, Ltd., Hereford Airfield. [4791

Jubilee PATENTED WORM DRIVE CLIP
the finest CLIP in the world

L. ROBINSON & CO. (GILLINGHAM) LTD.
Gillingham, Kent

AIRCRAFT FOR SALE

W. S. SHACKLETON, Ltd., 175, Piccadilly, London, W.1. EUROPE'S biggest aeroplane dealers, wish to issue AN apology and an explanation.

THERE is absolutely no truth in the rumour that Horace, our Tame Stressman, on a recent hiking trip in Mexico found the wreckage of a Flying Tentray on Popocatepetl.

THE Press, and particularly the American Press, has reported that the machine has Mars registration markings, is fitted with two 46 foot diameter motors, is built from tremendously hard metal and the 28 inches high pilot has been embalmed pending further investigation.

IT says the C.A.A., the A.R.B., and the S.T.T. (Service Technique Thibet) are looking into it.

HORACE, our Tame Stressman, explained on landing at London Airport yesterday that the whole thing is a preposterous hoax.

HE said that the Planet Mars is approximately 141,500,000 miles away from 175, Piccadilly, and that a Flying Tentray, even with two motors of 46 feet diameter, cruising at 1,000 miles per hour (on west nature) would take over sixteen years to get here.

HORACE said that Beings capable of developing such an amazing aircraft would have had more sense than to pick on this poor little pint-sized pilot to pile up their principal prototype pursuit plane on Popocatepetl.

"POSITIVE poppycock," said Horace, our Tame Stressman. The story is a fabrication and untrue in every detail."

"THE Truth, which I will now disclose for the first time, is that I found this particular aircraft myself when hiking near the summit of Pinillmmon some years ago. There were three motors, not two, and they were 54·7 feet diameter. It was built of relatively soft metal D.T.D. 1066 and the pilot was not 28 inches high—he was 24 inches in diameter. He is not—repeat not—embalmed in Mexico City."

"THE pint-sized pilot is pickled in potassium permanganate in Pentypridd Penitentiary. The footprints of the Abominable Snowman which led from the scene of the crash to the nearest local were made by myself."

W. S. SHACKLETON, Ltd., offer:—

£785—Auster Autocrat; £500 off list price; brand new apart from delivery flight; offered with new Certificate Airworthiness and all modifications on engine and airframe to date; it will not be possible to repeat this wonderful offer.

£13750.—Douglas Dakotas; freighter/passenger sound-proofed version, incorporating all C.A.A. and A.R.B. Modifications. We have been requested by Kearsley Airways, Ltd., who are ceasing flying operations, to sell their 3 Dakotas. We have examined these personally. They are in perfect condition and will compare favourably with any similar aircraft anywhere in the world. New Certificate Airworthiness and nil hours on engines and propellers since complete overhaul. The 26 Rumbold seats can be removed in a few minutes and the machines converted to pure freighters. Double cabin doors, 24-volt electrical systems, latest type cabin heating and de-icing. Full range of spares including engines and propellers. Price open to negotiation.

£475—Miles Aerovan, cost over £6,000, and with under 100 hours since new; 8 passengers; Marconi AD41/50 radio; Certificate just expired but renewable at modest cost.

£750—D.H. 86B Express Airliner with current Certificate Airworthiness, 2 crew and 12 passengers; Marconi AD41/50; lavatory and heating; the four Gipsy Six engines and the airframe have only about 10 hours since complete overhaul; the price is £750 not £7,500!

£1550—Miles Gemini; new Certificate Airworthiness and under 300 hours since new; fitted Sperrys, landing and navigation lights, etc.; this plane is a real beauty.

£245—Taylorcraft Plus D, 2-seater side-by-side, dual controls, new Certificate Airworthiness.

£375—Fairchild Argus 4-seater; new C. of A.

£895—Miles Messenger; long-term C. of A.

SEE also our advertisement under "Aircraft Wanted."

W. S. SHACKLETON, Ltd., 175, Piccadilly, London, W.1. Tel. Regent 2448-9. Overseas cables, "Shackbud London." [0070

AIRCRAFT ACCESSORIES AND ENGINES

NEW 20ft windsocks, white, silk cords; £6 each.—Webster & Hill, 13, Arthray Rd., Botley, Oxford. [4790

LARGE stocks for disposal of D.H. Queen Ills, IIs and 1s, Cheetah IX and X Gipsy Majors, Lycomings, Cirrus, etc.; hours varying from nil since new.—Rollason Engines, Ltd., Croydon Airport. Tel. Croydon 5151. [0576

VEREY pistols! Air navigation regs. (Section V, Para. 22b) require all aircraft to carry a Verey pistol; we can offer genuine Air Ministry pistols, £3.10 post paid; flares available ex stock, 9/6 per dozen, carriage paid.—Sharavia, Blackbushe Airport, Camberley, Surrey. [0567

HALL production valve seat grinder disassembly and replacement machines, wet type model A.W.V.P.-36, 230-250 volts, a.c. or d.c., for Rolls-Royce Merlin and Kestrel aero engines, etc.; brand new and complete in crates; £265 each.—G. E. Layte & Co., 19, The Highway, Rickmansworth, Bucks. [4726

AIRCRAFT spares: Cables (electrical and control), paints, dopes, fabric, instruments; airframe, engine and propeller spares for Anson, Fairchild, Hornet Moth, Tiger Moth, Moth Minor, Proctor, Q.6, Auster; wide range of A.O.S. spares; all material new and released; send us your requirements; keenest prices.—Western Airways, Airport, Weston-super-Mare 2700. [4761

AIRCRAFT ACCESSORIES AND ENGINES

FIRE!—No. 5 A.M. fire extinguishers with A.R.B. release always available from stock.—National Fire Protection Co., Ltd., Essex House, Station Rd., Leatherhead (2203). Works, Feltham and Hanworth. [2590

AIRCRAFT ACCESSORIES AND ENGINES WANTED

URGENTLY required, Queen III engines.—Vendair Aircraft, Croydon Airport. Croydon 5777. [4805

AIRCRAFT SERVICING

F. G. MILES, Ltd., Redhill Aerodrome, Surrey. Nutfield Ridge 2200.

AN approved design, maintenance and repair organisation staffed by experts on Miles aircraft. Major and Minor modifications a speciality; radio installations. APPROVED instrument test shop; specialists in race preparations.

F. G. MILES, Ltd., Redhill Aerodrome, Surrey. Nutfield Ridge 2200. [0581

BROOKLANDS AVIATION, Ltd., Brooklands Aerodrome, Weybridge.—C. of A. overhauls, modifications and conversions. Tel. Byfleet 456. [0305

REPAIRS and C. of A. overhaul for all types of aircraft.—Brooklands Aviation, Ltd., Civil Repair Service, Sywell Aerodrome, Northampton. Tel. Moulton 3261. [0307

HERTS & ESSEX AERO CLUB.—Repairs, maintenance and overhauls on Rapides, Proctors, etc., at competitive prices; hangarage, estimates free; C. of A. overhauls promptly carried out.—Broxbourne Aerodrome, Nazeing, Essex. Tel. Hoddesdon 2421, 3705 and 2453. [0306

NORMAN RANSON, Acrelecs, Ltd., for B.T.H., Eclipse and Rotax magneto; generator and starter motor repairs; Pesco and D.H. hydraulic pumps; general range of aircraft instruments, E.S.Is, R.O.C. and A.S.Is; distributors for Lodge Aviation plugs; A.I.D. and A.R.B. approved.—100, Main St., Prestwick, Ayrshire. [4740

BUSINESS AND PROPERTY FOR SALE

VALUABLE long lease of airfield available together with fleet of aircraft, Rapides, Proctors, Austers; hangars workshops and equipment. Also proprietary flying club, airfield transport and fully formed private limited company; all at £17,500.—Enquiries in writing Box 2889. [4745

CARAVANS

POSTED?

MANY lucky R.A.F. types now find postings no bother at all; if you want to know why drop in and have a chat with us about your particular accommodation problem, you can obtain a mobile home to suit your taste and pocket immediately from F.O.C. Caravan Centre, where you can inspect 40 new and slightly used caravans in comfort; the F.O.C. service that satisfies includes buying out of income, insurance, hire and get you to your site service; just printed! A pamphlet packed with information of interest to you; write for your free copy.

F.O.C. CARAVAN CENTRE, 200, Cricklewood Broadway, London, N.W.2. Gladstone 2234. Open daily from 8.30-6. Sundays by appointment only [0307

A CARAVAN "20 Questions"?

A WHO can answer caravan questions better than ex-editor caravan paper living in van 15 years? Send your queries to him and he'll answer them and give you his candid opinion on any van—an unbiased opinion, because he hasn't just a few vans to sell, but one of U.K.'s biggest selection with all the best-known makes, all guaranteed, too, with a free van for a faulty one, better hire purchase terms, too; send for brochures and advice articles to Head Office:—

A. S. JENKINSON, Bath Rd., Taplow, Bucks. Tel. Maidenhead 2610. Open always. Right on Main A4, Taplow Station 4 minutes' walk.

LONDON Branch (equal selection; the only large caravan sales site in the centre of London; ex-R.A.F. Manager). Corner Ebury St. and Semley Place, S.W.1. Tel. Sloane 9233. Open 7 days a week, 9 a.m. to 7 p.m. Near Airways House, Buckingham Palace Rd., Victoria Station 5 minutes' walk. [0278

FOR all types of caravans, living or holiday, write for catalogues to Country Life Caravans, Romsey. [0578

LET a "Sunbeam" brighten your life—see this superb 22ft, 4-room, £858 Rollalong Living Van at the South West Distributors, the Pathfinder Caravan Co., Ltd., Tedburn St Mary, nr Exeter. C.D.A.A. Member [0578

BERKELEY caravans, latest Ambassador de luxe mobile homes, £950; Courier, £450; de luxe Courier, £499; all-purpose Deputy, £425.—Full particulars from Mantle's Garages, Ltd., Biggleswade, Beds. Tel. 2113. [0567

PRICE reductions everywhere, but before deciding see the new Rasby 14ft 4-berth, double panelled, gas lighting and cooking; finest value in the trade to-day, £254; h.p. terms arranged.—Rasby Caravans, 669, High Rd., Tottenham. Tel. Tottenham 2308. [4805

AS manufacturers and distributors of all leading makes of reliable caravans we offer quick delivery of Berkeley Ambassador and Courier, Investor, Raven Cottage, Westway; we can offer the most attractive hire-purchase terms and arrange delivery and sites with water and sanitary facilities, write for free copy of Caravan Topics.—

WATFORD CARAVANS, Ltd., Hall Park Garage, Berkhamsted. Tel. Berkhamsted 820. [4796

1950 Land Schooner, year's guarantee, 17ft by 6ft 6in overall, aluminium exterior, double panelled, 4 berths, Calor cooking and lighting, complete with lino, curtains, mats, sink, etc., no extras, £325; shells from £165, chassis from £75.—Abbey Autos, rear of 44-46, Chase Side, Southgate (near Tube). Palmers Green 4540 or Waltham Cross 5838 evenings. [4794

CELLULOSE

"SPRAYING Handbook," 1950 ed. Car-Caravan Industrial-Domestic-Stoving-Plock-Leather Spraying, 3/6 post free. Catalogue of Paints and Plant Hire Free.—Leonard Brooks, 5, Harold Wood, Romford. [0585

CLOTHING

R.A.F. and R.N. officers' uniforms purchased, large selection of R.A.F. officers' kit for sale, new and reconditioned.—Fisher's Service, Outfitters, 86-88, Wellington St., Woolwich. Tel. Woolwich 1085. [0567

CLUBS

REDHILL FLYING CLUB.

LEARN to fly amidst delightful surroundings at Redhill Aerodrome, Surrey, South London's nearest flying centre, 25 miles from Hyde Park Corner, 32 minutes from Victoria Station; flying training on Austers and Magisters, £3/10 dual, £3 solo, per hr., instrument flying, instructors' B licence courses; attractive clubhouse with full catering facilities. Tel. Nutfield Ridge 2245-5254. [0547

SURREY FLYING CLUB, Gatwick Airport, Surrey, attractive clubhouse, full bar and catering facilities.

SAFE, easy to fly, Piper Cubs at low rates, £2/5 solo, dual £2/15; also Fairchild Argus; daily hire; special reduced hire rates available.

VICTORIA 8m. to Gatwick Airport direct, 35 minutes, step from platform on to airport. Full particulars write, 'phone or call personally. 'Phone Crawley 695, extn. 3. [0293

HERTS & ESSEX AERO CLUB, Broxbourne Aerodrome, Nazeing, Essex, train from Liverpool Street or Green Line Route 715 from Broadcasting House; trial lesson, half an hour for 30/-.—Tel. Hoddesdon 2453 and 2422l. [0830

BREVET FLYING CLUB.—Fully licensed residential clubhouse, excellent food; membership now exceeds 10,000; meet the flying types at the "Brevet," membership £1/1 p.a.—Secretary, 11, Chesterfield St., Mayfair, W.1. Gro. 1353. [0392

LEARN to fly for £24, instructors' licences and instrument flying for £3 an hour; night flying £3/10 an hour; residence 4½gns weekly, approval M.C.A. private pilot's licence course.—Wiltshire School of Flying, Ltd., Thruxton Aerodrome, Andover, Hants. [0255

WEEKLY gliding courses for beginners; every week from June to September inclusive. Full tuition to B standard, with R.Ae.C. certificates included. Hotel accommodation, all meals. Club membership fees and all flying fees for inclusive charge of £12/12. Splendid opportunity to learn world's most sport while enjoying country holiday. Spacious airfield in West Country, 650ft above sea level.—Apply for full particulars and descriptive leaflet. Bristol Gliding Club, 2, Berkshire Rd., Bristol, 7. [4756

CONSULTANTS

WING COMMANDER R. H. STOCKEN, F.R.Ae.S., Eagle House, 109, Jermyn St., London, S.W.1. Tel. Whitehall 8863. [0419

HOTELS AND ACCOMMODATION

BOURNEMOUTH.—New Forest and sea trips to Isle of Wight.—Spend happy holidays at Claremont Hall, Florence Rd., Boscombe, Bournemouth. [4565

ROYAL OAK HOTEL, Keswick-on-Derwentwater, heart of English Lake District, offers restful holiday to Air Force personnel; first-class accommodation at reasonable charges. [0414

INSURANCE

ALL types of aircraft insurance and personal accident cover.—Apply to J. W. T. Amey, Messrs. R. J. Moffatt & Co., Percy House, 796, High Rd., Tottenham, N.17. Tottenham 2003-4-5. [0504

PACKING AND SHIPPING

R. & J. PARK, Ltd., 145-9, Fenchurch St., E.C.2. Tel. Mansion House 5083, official packers and shippers to the aircraft industry. [0012

TIME RECORDERS

STAFF time checking and job costing time recorders (all makes) for quick cash sale; exceptional condition.—Box 6905. [0040

TIME recorders, service rental.—Tel. Hop 239. Time Recorded Supply & Maintenance Co., 157-159, Borough High St., S.E.1. [4755

TUITION

AIRCRAFT or automobile engineering. Complete practical and technical training for entry to either industry.—Syllabus from Bursar, College of Automobile and Aeronautical Engineering, Sydney St., Chelsea, S.W.3. Flaxman 0031. [0019

THE LONDON SCHOOL OF AIR NAVIGATION (1949), Ltd., provides full- or part-time tutorial services for private, commercial, senior commercial, airline transport, instrument ratings and flight navigators licences; courses are also prepared on a "study-as-you-work" basis.

R/T licences—short courses each Tuesday.

LINK trainer instruction, including S.B.A., I.L.S., R/R, Q.D.M., R/Compass, G.C.A. and link instructors' course; flying arranged; brochures and terms on application to 6-10, King W.6. Riv. 7400. [0277

SCHOOL OF NAVIGATION, University College, Wartash, Southampton, flight navigators' course £13 for nine months' tuition; pilot licences, £7-£15 for six months' tuition; Link instruction all approach systems, 10/- per hour or £3/10 for ten hours, postal courses, hall of residence. [0557

SOUTHEND MUNICIPAL FLYING SCHOOL. Tel. Rochford 56204. No entrance fee; no subscriptions; M.C.A. approved for 30-hour course for private pilot's licence; Auster Tiger Moth and Proctor aircraft; solo from £2/15 per hour; dual from £3 per hour; Austers and Proctor fitted with V.H.F. radio.

NIGHT flying in Austers £4/5 per hour dual or solo

LINK trainer, 10/- per hour; courses for R/T operator's licence and instructor's endorsement.

FLYING training to commercial licence standard, restaurant and residential accommodation. [0332

AIR SERVICE TRAINING OF HAMBLE is recognised as the world over as the premier civilian Aeronautical Training Establishment, christened by H.R.H. the Duke of Gloucester "Britain's Air University"; it provides full residential training facilities for civilians and Service personnel of all nationalities in flying, radio, air navigation and aircraft engineering.—Apply the Commandant. [0327

TUITION

WIRELESS.—Youths 15 upwards, trained for good posts as radio officers, vacancies now available, comm. salaries (air) £550, (marine) £360, all found; also short conversion course for 1st class Flight R.O.'s licence day attendance, boarding arranged.—Dept. "F," London Telegraph Training College, Ltd., 30, Penywern Rd., Earl's Court, London, S.W.5. (Tel. Flaxman 8721). Est. 1898. [0299

TYRES

SHARMANS TYRE SERVICE for guaranteed deep tread remoulds. Goodyear or Firestone pattern; take a look at these drastically reduced sample prices.—5.00-16, 40/-; 5.25-16, 43/-; 5.50-16, 15/4; 5.75-16, 48/11; 6.00-16, 53/-; (Jeep covers) 70/-; 6.25/6.50-16, 61/7; 7.00-16, 66/9; 7.50-15, 74/5; 4.00-17, 29/3; 4.50-17, 36/3; 4.75/5.00-17, 45/-; 5.25/5.50-17, 48/9; 6.00-17, 67/2; 7.00-17, 70/6; 4.00-19, 31/4; 4.50-18, 36/9; 4.75/5.00-18, 44/6; 5.25/5.50-18, 48/11; 6.00/6.50-18, 68/6; 7.00-18, 71/6; 5.25/5.50-19, 52/6; 6.00/6.50-19, 71/4; 7.00-19, 74/6; 5.00-20, 47/4; 5.25/5.50-20, 53/9; 6.00-20, 75/9; 6.50/7.00-20, 75/7; 4.50/4.75/5.00-21, 51/10; please write or 'phone for prices on all other sizes; despatch by first passenger train 5/6 per tyre extra.

SHARMAN'S, Lanark Rd., Maida Vale, London, W.9. Cunningham 7831-8. [0572

SITUATIONS VACANT

ROYAL NAVY

SHORT Service Commissions in the Instructor Branch.

1—APPLICATIONS are invited from University Graduates and qualified teachers under 35 years of age for Short Service Commissions or 3, 4 or 5 years in the Instructor Branch, Royal Navy. Requirements are mainly for officers with qualifications in Mathematics, Science (Physics, Chemistry, Metallurgy) or Engineering, but a few vacancies exist for officers with degrees in English, History, Geography or Economics with a sound Mathematics or Science background; opportunities will be afforded for officers, after two years' service, to be selected for permanent commissions. A short service engagement in the Instructor branch will discharge any candidate's obligation under the National Service Acts.

2—Entry will be in two grades; selected candidates with 1st or 2nd Class Honours Degrees receive approximately £928 in their first year's service; £547 in second year; £458 in third and fourth years; £478 in fifth year. Other candidates receive £357 in first year; £310 in second and third years; £547 in fourth and fifth years. Previous officer service in the recent war will be recognised for adjustment of seniority and rate of pay on entry. Accommodation and rations are provided or allowance in lieu. Married Officers if aged 25 or over normally receive Marriage Allowance of £336 per annum if not accommodated in official married quarters, £285 per annum if they are so accommodated and £146 per annum in either case if under 25. An Initial Outfit Allowance of £105 is paid, together with a free issue of certain articles of clothing; a reduced allowance is payable to candidates with previous Naval Service as officers. Tax free gratuities of £300, £400 or £500 are payable at the end of 3, 4 or 5 years respectively.

3—Short Service in the Instructor Branch will, if desired, be treated as contributory service under the Teachers' (Superannuation) Acts, Superannuation contributions being deducted from the above gratuities.

4—Instructor Officers serve both ashore and afloat and their duties include both technical instruction and general educaton. Officers with suitable qualifications may also be trained and appointed for full or part-time meteorological and weather forecasting duties.

5—Apply to Director (P), Education Department, Admiralty, London, S.W.1, for fuller details and application forms. [4794

SHORT BROTHERS & HARLAND, Ltd.

BELFAST,

NORTHERN IRELAND.

HAVE vacancies in their design office in Belfast for experienced aircraft stressmen, senior and junior, preferably with experience on metal aircraft.

SELECTED applicants living in England will be interviewed either in London or convenient to their place of residence.

DETAILS of housing accommodation available and facilities for removal will be supplied at the time of interview.

APPLICATIONS, giving age, details of experience, qualifications, etc., and salary expected, should be addressed to Short Brothers & Harland, Ltd., 17, Grosvenor St., London, W.1. [0562

APPLICATIONS are invited for the post of:—

SENIOR assistant for structural test department, applicants should possess an engineering degree, be experienced in the design of structure for, and the carrying out of tests on, aircraft components, materials, etc., together with a knowledge of electronics, and should have held a similar position with an established aircraft firm; the appointment offers interesting work and scope for the right man.

TEST assistant, for structural tests work; applicants should have attained Inter-B.Sc., or Higher National Certificate standard and have had test laboratory experience preferably on aircraft components and metals.

DESIGNER-DRAUGHTSMAN, preferably with good physics background for the design of test apparatus and equipment, required by the research department, able to work on his own initiative.

LOCATION, South Coast; superannuation scheme, hostel accommodation available.—Box 2847. [4726

EXPERIENCED draughtsman for aircraft accessories required.

APPLY Personnel Department, Vickers-Armstrongs, Ltd., South Marston, Swindon, Wilts. [4717

RATEFIXER with aircraft experience required.—Apply Personnel Department Vickers-Armstrongs, Ltd., Hursley Park, near Winchester. [4801

GOOD senior draughtsmen required for interesting programme of new work.—Apply in the first instance to the Chief Engineer, Percival Aircraft Ltd., The Airport, Luton. [0593

FIELD'S

A Brand New PROCTOR

Mark V

Can be obtained only if advantage is taken of this last chance. There are six — and six only — of these aircraft, the last off the Percival production line, which we have decided to clear at the ridiculously low price of £975.—.—, (nine hundred and seventy—five pounds), complete with 12 months C of A. These aircraft have never been flown. They are upholstered in high quality hide and fitted with a Gipsy Queen II engine, just off complete overhaul. Remember the price . . . . .

£975

FIELD AIRCRAFT SERVICES LTD.

Croydon Airport, Surrey

Telephone: Croydon 7777.
Cables: Fieldair, Croydon.

THE DE HAVILLAND AIRCRAFT COMPANY LIMITED

have the following vacancies in their

HATFIELD & LONDON DESIGN OFFICES

HATFIELD :-

SENIOR DESIGNERS with experience in controlling the design of Aircraft major components.

SENIOR STRESSMEN with minimum of five years' experience in stress analysis of Aircraft Structures.

DETAIL DESIGNERS and INTERMEDIATE DRAUGHTSMEN

Assistance will be given to obtain local living accommodation.

LONDON :-
(Regent Street)

SENIOR and INTERMEDIATE DRAUGHTSMEN with Aircraft experience preferred. Consideration will be given to applicants experienced in light mechanical engineering.

Applications for **HATFIELD** or **LONDON** vacancies should state experience, age and salary required and be addressed to :—

The Chief Draughtsman,
The de Havilland Aircraft Co., Ltd.,
Hatfield, Herts.

SITUATIONS VACANT

LOCKHEED HYDRAULIC BRAKE CO., (1931) & ASSOCIATED COMPANIES.

LEAMINGTON Spa.

(AIRCRAFT and Automobile Branches.)

DESIGN draughtsmen

VACANCIES occur for several draughtsmen (senior and junior), age 23-30, salary equal to or above A.E.S.D. rates according to experience and qualifications, permanent, progressive positions and good working conditions.—Write in first instance giving full particulars to:—

PERSONNEL Manager, Lockheed Hydraulic Brake Co., Ltd., Leamington Spa. [4800

SENIOR stressmen required immediately, first-class men with at least ten years' experience.

UNFURNISHED modern flats available to selected applicants.

REPLIES, giving age and full details of technical qualifications and experience, to be addressed to PERSONNEL Officer, Saunders-Roe, Ltd., East Cowes, Isle of Wight. [0585

DESIGN Engineer urgently required for responsible work on aircraft heat transfer equipment and gas flow analysis.

APPLICANT must have sound engineering background, preferably in aircraft engineering field; please apply in writing stating qualifications, experience, age, salary etc., to—Personnel Officer, Saunders-Roe, Ltd., East Cowes, I.W. [4729

COUNTY Borough Southend-on-Sea.

APPLICATIONS are invited for the appointment of flying instructor at the Southend Municipal Airport.

THE salary for the appointment is £420—£15—£465 per annum, plus flying pay of 5/- per hour flown during the daytime and 10/- per hour at night. The appointment, which is terminable upon one month's notice, is subject to the National conditions of service to the Local Government Superannuation Act, 1937, and to medical examination. Applicants for the appointment must possess a current "B" pilot's licence, with instructor's endorsement and possession of a radio telephony licence will be an advantage.

APPLICATIONS, containing particulars of qualifications experience, etc., and accompanied by copies of three recent testimonials, to be submitted to the undersigned not later than Friday, the 14th April, 1950.

ARCHIBALD GLEN, Town Clerk, Municipal Buildings, Southend-on-Sea. [4826

ELECTRICIANS required for repair of aircraft electrical services, clean, interesting work with good conditions.—Apply Brooklands Aviation, Ltd., Sywell Repair Factory, Sywell, Northampton. [4795

LINK trainer operator wanted, must be experienced in operation and maintenance of Link trainers.—Apply Secretary, Universal Flying Services, Ltd., No. 16 R.F.S., Fair Oaks Aerodrome, Woking, Surrey. [4754

APPLICATIONS are invited from design draughtsmen and stressmen, also technical assistants with combined design and performance experience for work on both reciprocating and gas turbine aero engines.

APPLICATIONS should state full particulars of experience and qualifications and should be addressed to The Personnel Manager, The de Havilland Engine Co. Ltd., Stonegrove, Edgware, Middx. [0575

ELECTRICAL field service representative required by aircraft manufacturers' service department in the South; applicants must possess extensive knowledge and outstanding practical experience of the servicing and repair of modern aircraft electrical systems; a current 'A' licence and a flair for service work.—Box 3242. [4787

SALES executive required by leading firm of light trailer and chassis manufacturers, must have some technical experience and knowledge of motor trade; permanent position and good prospects for keen, capable man; write, stating age, experience, references and salary required; North-Western area.—Box 3221. [4790

CHIEF inspector required by well known approved organisation specialising in high grade aircraft electrical equipment; applicants aged 30 to 40, must have factory experience and thorough knowledge A.I.D. and A.R.B. procedure; preference will be given to those who hold or have held licences.—Full details of experience to Box 3222. [4793

APPLICATIONS are invited from senior and intermediate design draughtsmen, experience of aero engine design desirable but not essential; please write, stating age and giving details of previous experience in chronological order, to—The Personnel Officer, The de Havilland Engine Co. Ltd., Stag Lane, Edgware, Middlesex. [0469

H. M. HOBSON, Ltd., Fordhouse, Wolverhampton, invite applications for senior designers required immediately for work on interesting projects connected with the fuel metering equipment and hydraulic controls for aircraft and also for detail draughtsmen for aircraft, flight and fuel controls.—Apply stating age, experience, and salary required. [4759

APPLICATIONS are invited from senior stressmen with first-class qualifications desirous of working on new project of most interesting kind; excellent prospects of advancement for candidates with experience and enthusiasm.—Apply, stating experience, qualifications and salary required, to Chief Technician, Gloster Aircraft Co., Witcombe, Glos. [0440

DOWTY EQUIPMENT, Limited, Aircraft Hydraulic Engineers, Arle Court, Cheltenham, have vacancies in their drawing office for experienced draughtsmen (design and mechanical and stressmen). The working conditions, environment and prospects of advancement are excellent and the company pays good salary rates.—Write to Personnel Manager for leaflet about employment. [4774

ENGINEERS required for service work on aircraft radio and electronic equipment; must be conversant with modern developments in this field and preferably with previous experience in the aircraft industry; consideration will only be given to those applicants with a sound technical background, and who are prepared to travel.—Apply, with full details, to the Personnel Manager, Sperry Gyroscope Co. Ltd., Great West Rd., Brentford, Middlesex. [4741

THE AERONAUTICAL WORLD IS SAYING——DEAL WITH:—

ROLLASON ENGINES LTD. CROYDON AIRPORT
Tel. CRO. 5151/3 CRO. 7744 Ext. 69

LARGE STOCKS OF **DE HAVILLAND GIPSY MAJORS, QUEENS 111's, 11's, and 1's—ARMSTRONG SIDDELEY CHEETAH IX's and X's.**
ALL ENGINES HAVE BEEN SERVICED AND ARE READY FOR IMMEDIATE INSTALLATION.
ENGINE HOURS VARY FROM NIL SINCE EITHER NEW OR COMPLETE OVERHAUL. QUANTITIES OF SPARES ALWAYS AVAILABLE.
MAY WE QUOTE FOR YOUR REQUIREMENTS.

VERY HIGHLY COMPETITIVE PRICES QUOTED

"Pulsometer" **TANK FUEL PUMPS**

FITTED TO
GLOSTER METEOR 8
VICKERS SUPERMARINE FIGHTER 510
VICKERS VARSITY TRAINER
AND MANY OTHER MILITARY AND CIVIL AIRCRAFT

FOR MILITARY AIRCRAFT
Give Reliable Service and Long Life

Pulsometer Engineering C.L. READING

BIRSO
NON-FERROUS CASTINGS

Our specialised knowledge is offered to you in the supply of Castings from a few ounces up to 5 tons—in
PHOSPHOR BRONZE, GUNMETAL, MANGANESE BRONZE, ALUMINIUM BRONZE
(Tensile Strength 45 tons per sq. in.)
ALSO
Light Alloy Castings · "BIRSO" Chill-Cast Rods and Tubes
Centrifugally-Cast Worm-Wheel Blanks · Ingot Metals
Phosphor Copper · Phosphor Tin · Precision Machined Parts
Finished Propellers, etc.

Fully approved by Admiralty and A.I.D.

T. M. BIRKETT & SONS LTD.
HANLEY · STAFFS
Grams: Birkett, Hanley Phone: Stoke-on-Trent 2184-5-6
In association with
BILLINGTON & NEWTON LTD.
LONGPORT, STOKE-ON-TRENT
Grams: Bronze, Phone, Longport Phone: Stoke-on-Trent 87303-4 & 8814
BIRSO

Seeing is believing

The fine materials available to the British aviation industry have made possible the high factor of safety for which its aircraft are known. Because they are fireproof, Tinkertex fabrics for cabin upholstery and furnishing play an important part. They are also mothproof and vermin proof.

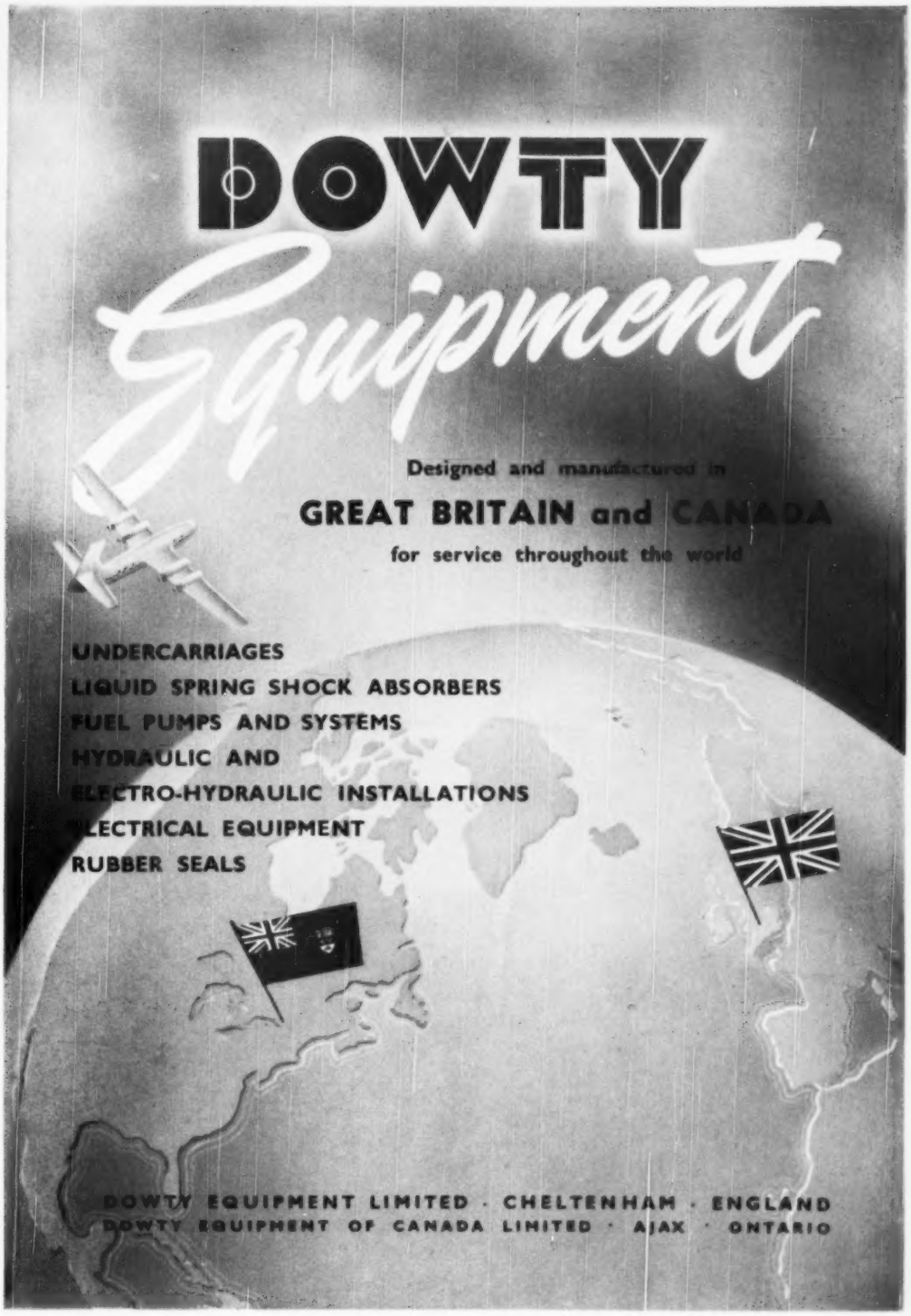
TINKERTEX (LYD)

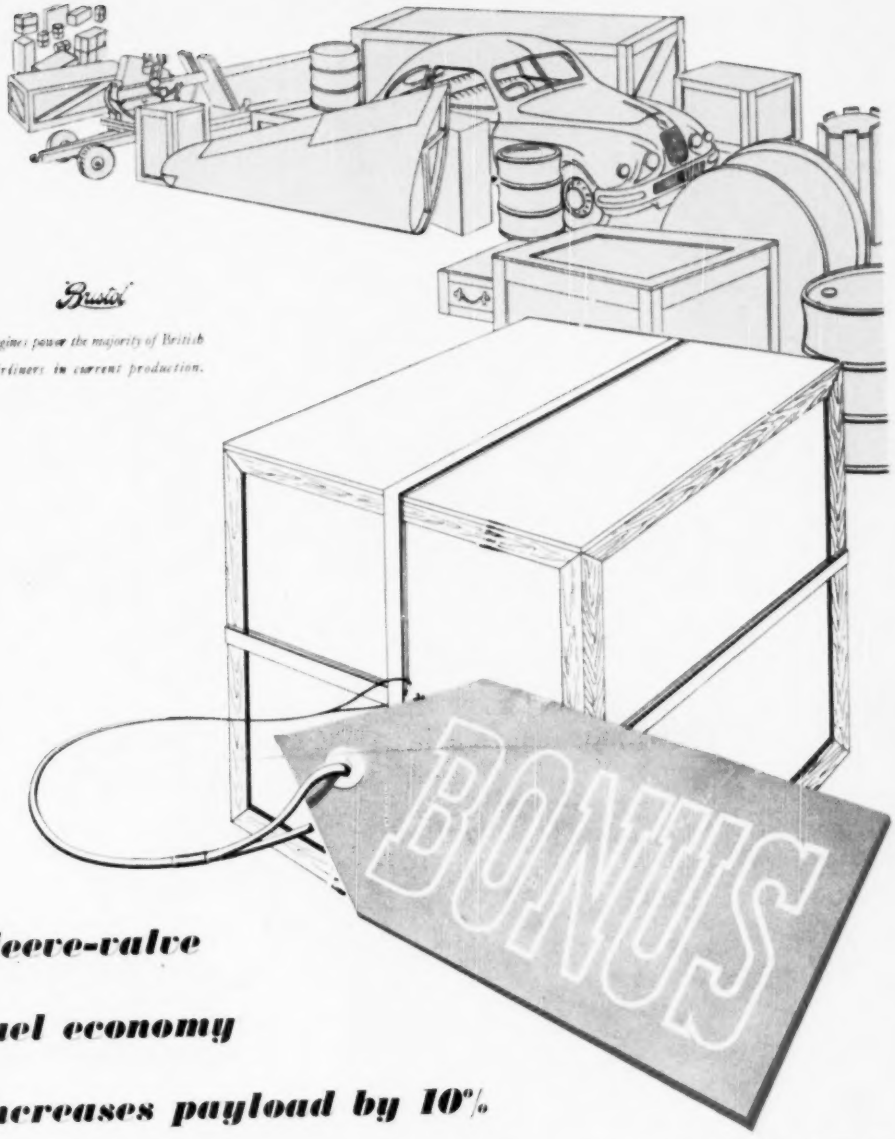
UPHOLSTERY FABRICS

Members Society British Aircraft Constructors

HOLMFIRTH, nr. HUDDERSFIELD, YORKSHIRE, ENGLAND
Telephone: 636/7. Telegrams: Tinkertex, Holmfirth

Printed in Great Britain by The Cornwall Press Ltd., 1-6, Paris Garden, London, S.E.1, for Iliffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1. "Flight" can be obtained abroad from the following: Australasia and New Zealand: Gordon & Gotch Ltd. India: A. H. Wheeler & Co. Canada: Imperial News Co., Gordon & Gotch Ltd. South Africa: Central News Agency, Ltd.; Wm. Dawson & Sons (S.A.), Ltd. United States: The International News Co. Entered as Second Class at the New York, U.S.A., Post Office.


DOWTY
Equipment
Designed and manufactured in
GREAT BRITAIN and CANADA
for service throughout the world
UNDERCARRIAGES
LIQUID SPRING SHOCK ABSORBERS
FUEL PUMPS AND SYSTEMS
HYDRAULIC AND
ELECTRO-HYDRAULIC INSTALLATIONS
ELECTRICAL EQUIPMENT
RUBBER SEALS
DOWTY EQUIPMENT LIMITED · CHELTENHAM · ENGLAND
DOWTY EQUIPMENT OF CANADA LIMITED · AJAX · ONTARIO



Bristol

engines power the majority of British airliners in current production.

sleeve-valve fuel economy increases payload by 10%

The excellent specific fuel consumption of "Bristol" Hercules sleeve-valve engines gives an extra 10% payload. For many years development has been directed towards the achievement of the lowest possible fuel consumption consistent with reliability. Thousands of sleeve-valve engines supplied for civil aircraft, long-range bombers, night-fighters and carrier-borne aircraft—for which low fuel consumption is of paramount importance — give testimony to this particularly advantageous characteristic of "Bristol" Hercules engines.

THE Bristol AEROPLANE COMPANY LIMITED ENGLAND